National Aeronautics and Space Administration

Fiscal Year 2006

Performance and Accountability Report

NASA's Performance and Accountability Report

This is the National Aeronautics and Space Administration's (NASA) Fiscal Year 2006 (FY 2006) Performance and Accountability Report. It is a detailed account of NASA's performance in achieving the long-term Strategic Goals, multi-year Outcomes, and Annual Performance Goals for the Agency's programs, management, and budget. This Report includes detailed performance information and financial statements, as well as management challenges and NASA's plans and efforts to overcome them.

NASA's FY 2006 Performance and Accountability Report meets relevant U.S. government reporting requirements (including the *Government Performance and Results Act of 1993*, the *Chief Financial Officers Act of 1990*, and the *Federal Financial Management Improvement Act of 1996*). This Report also tells the American people how NASA is doing.

Part 1—Management Discussion & Analysis. Part 1 highlights NASA's overall performance, including financial and management activities. Part 1 also describes NASA's organization, performance assessment and rating processes, and management control systems.

Part 2—Detailed Performance Data. Part 2 provides detailed information on NASA's progress toward achieving specific milestones and goals as defined in the Agency's Strategic Plan and, in further detail, in the FY 2006 Performance Plan Update. Part 2 also includes the Agency's Performance Improvement Plan, which details the actions that NASA is taking to achieve all measures the Agency did not meet in FY 2006.

Part 3—Financials. Part 3 includes the Agency's financial statements, audit results by independent accountants in accordance with government auditing standards, and responses to audit findings.

Appendices—The Appendices include required Inspector General follow-up audits (Appendix A), an FY 2005 Performance Improvement Update (Appendix B), a list of OMB Program Assessment Rating Tool (PART) recommendations for FY 2005 (Appendix C), and detailed source information (Appendix D).

A PDF version of this Performance and Accountability Report is available at *http://www.nasa.gov/about/budget/index.html*. Please send questions and comments to *hq-par@mail.nasa.gov*.

Cover: A Delta II rocket stands ready at Vandenberg Air Force Base, California, to launch the CALIPSO and Cloudsat satellites. The two satellites, which launched on April 28, 2006, gather information about clouds, ice crystals, aerosols, and a range of related subjects. (NASA/B. Ingalls)

Message from the Administrator

November 15, 2006

Fiscal Year 2006 was a very good year for NASA. We made significant progress in implementing the goals articulated in NASA's Strategic Plan to carry out our mission of space exploration, scientific discovery, and aeronautics research. With the NASA Authorization Act of 2005, Congress affirmed the Vision for Space Exploration and the course that President Bush set for us to advance our Nation's economic, scientific, and security interests. We have much remaining yet to accomplish, but we are making steady progress in achieving our goals.

Robotic and human spaceflight are the most technically challenging endeavors we can undertake as a Nation. Completion of the International Space Station (ISS), retirement of the Space Shuttle, and transitioning to new exploration systems will be NASA's greatest challenges over the next several years, and we are moving forward to achieve all three goals. In August 2006, we re-started assembly of the ISS, and we plan to complete construction by 2010 and then retire the Space Shuttle. Following the Exploration Systems Architecture Study completed in 2005, this year we awarded a contract to design and develop the Orion Crew Exploration Vehicle that will return our astronauts to the Moon and eventually carry them to Mars and other destinations. NASA also signed Space Act Agreements to demonstrate commercial crew and cargo transportation services to the ISS, and we refined our designs for the Ares I Crew Launch Vehicle and Ares V heavy-lift Cargo Launch Vehicle to save money in life-cycle costs. In the coming months, NASA will enter into development contracts for the upper stage of the Ares I Crew Launch Vehicle, and we are partnering with the U.S. Air Force in developing the RS-68 engine for the Ares V Cargo Launch Vehicle.

We are fostering a work environment throughout NASA in which engineers and technicians feel free to address problems that may affect the safety of the crew and mission. We have completed three successful Shuttle flights to the ISS since the Space Shuttle *Columbia* accident, and we are on track to complete all planned Shuttle flights by 2010, including a servicing mission to the Hubble Space Telescope in 2008.

NASA continues to be a world leader in space and Earth sciences. In 2006, the Nobel Prize for Physics was awarded to Dr. John Mather, the first NASA employee to be awarded this honor. This year, we launched the New Horizons mission to Pluto, the Cloudsat and CALIPSO satellites to monitor global climate change, the STEREO mission to view the effects of solar activity on the Earth, and two additional heliophysics satellites—TWINS–A and SOLAR–B. Today, robotic rovers and satellites explore Mars searching for evidence of life. Scientists working with NASA's astronomy and astrophysics missions search for planets—and possibly life—around other stars and try to unlock the mysteries of the way the universe began and may ultimately end.

In FY 2006, we restructured our aeronautics research program to ensure that it will support long-term, cutting-edge research aligned to our national priorities for the benefit of the broad aeronautics community in academia, industry, and other government agencies. This restructuring reflects NASA's commitment to restoring and maintaining core aeronautics capabilities within the Centers.

These initiatives are part of NASA's objective of creating ten healthy Centers, with each actively contributing to all NASA missions. In FY 2006, we also began tackling the problem of our "uncovered capacity" workforce, those

employees who are not assigned directly to specific programs. At the beginning of FY 2006, NASA had approximately 3,000 uncovered positions, but by the end of the fiscal year, the estimate was reduced to approximately 300 positions.

We have many challenges ahead of us. In submitting this Report of our achievements and challenges in FY 2006, NASA accepts the responsibility of reporting performance and financial data accurately and reliably with the same vigor as we conduct our scientific research. For FY 2006, I can provide reasonable assurance that the performance data in this Report are complete and reliable. Performance data limitations are documented explicitly.

In accordance with the Federal Financial Management Improvement Act (FFMIA), NASA's Integrated Financial Management System Core Financial Module (IFMSCFM) produces financial and budget reports. However, because of unresolved data conversion issues, the system is unable to provide reliable and timely information for managing current operations and safeguarding assets. Therefore, NASA's IFMSCFM does not comply fully with the requirements of the FFMIA, and the independent auditors were unable to render an opinion on our FY 2006 financial statements. Instead, they issued a disclaimer of opinion. Therefore, I cannot provide reasonable assurance that the financial data in this Report are complete and reliable. We will continue to focus on bringing NASA's financial management system into compliance.

NASA continues to improve the Agency's internal control environment, compliance with established requirements and standards, and heightened stewardship of the resources and assets entrusted to the Agency. In FY 2006, NASA resolved two of four material weaknesses reported in FY 2005. This year, we report two continuing material weaknesses and one new material weakness in internal control. With the exception of these three material weaknesses, I submit a qualified Statement of Assurance that reasonable controls are in place to achieve the Agency's programmatic, institutional, and financial management objectives. Internal control initiatives and corrective action plans for closing material weaknesses are discussed in detail within the Systems, Controls, & Legal Compliance chapter, Part 1, of this Report.

We have a lot of work ahead of us, but we are making solid progress. Therefore, it is my pleasure to submit NASA's FY 2006 Performance and Accountability Report.

Michael D. Griffin
Administrator

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Part 1: Management Discussion & Analysis

Previous page: A fish-eye-view lens curves the fixed service structure toward Space Shuttle *Atlantis* as it blasts off Launch Pad 39B, propelled by columns of fire from the solid rocket boosters. At the lower left is the White Room that, when extended, gave the mission crew access to the Shuttle. After lift-off, *Atlantis* headed for rendezvous with the International Space Station (ISS) on mission STS-115. Mission STS-115 was the 116th Space Shuttle flight, the 27th flight for *Atlantis*, and the 19th flight to the ISS. (NASA)

Above: A crew transport vehicle, a modified "people mover" used at airports, approaches Shuttle *Discovery* after the orbiter was cleared for crew departure at the conclusion of STS-121. The crew exits the Shuttle into a crew hatch access vehicle and, after a brief medical examination, transfers into the crew transportation vehicle. The landing was the 32nd for *Discovery*. (NASA)

Mission, Vision, Values, & Organization

NASA's Mission Is on Track

Congress enacted the *National Aeronautics and Space Act of 1958* to provide for research into problems of flight within and outside Earth's atmosphere and to ensure that the United States conducts activities in space devoted to peaceful purposes for the benefit of humankind. Nearly 50 years later, NASA is continuing the American traditions of pioneering, exploration, and expanding the realm of what is possible by using NASA's unique competencies in science and engineering to fulfill the Agency's purpose and achieve NASA's Mission:

To pioneer the future in space exploration, scientific discovery, and aeronautics research.

Making Progress

On January 14, 2004, President George W. Bush announced *A Renewed Spirit of Discovery: The President's Vision for U.S. Space Exploration*, which Congress endorsed in the *NASA Authorization Act of 2005*. This directive commits the Nation to a journey of exploring the solar system, returning astronauts to the Moon in the next decade, then venturing to Mars and beyond. In issuing it, the President challenged NASA to establish innovative programs to enhance understanding of the planets in this solar system and around other stars, to ask new questions, and to answer questions that are as old as humankind.

To achieve this directive, NASA established six Strategic Goals:

Strategic Goal 1: Fly the Shuttle as safely as possible until its retirement, not later than 2010.

Strategic Goal 2: Complete the International Space Station in a manner consistent with NASA's International partner commitments and the needs of human exploration.

Strategic Goal 3: Develop a balanced overall program of science, exploration, and aeronautics consistent with the redirection of the human spaceflight program to focus on exploration.

Strategic Goal 4: Bring a new Crew Exploration Vehicle into service as soon as possible after Shuttle retirement.

Strategic Goal 5: Encourage the pursuit of appropriate partnerships with the emerging commercial space sector.

Strategic Goal 6: Establish a lunar return program having the maximum possible utility for later missions to Mars and other destinations.

NASA's Values

The Agency's four shared core values support NASA's commitment to technical excellence and express the ethics that guide the Agency's behavior. These values are the underpinnings of NASA's spirit and resolve.

- **Safety:** NASA's constant attention to safety is the cornerstone upon which NASA builds mission success. NASA employees are committed, individually and as a team, to protecting the safety and health of the public, NASA team members, and the assets that the Nation entrusts to the Agency.
- **Teamwork:** NASA's most powerful tool for achieving mission success is the Agency's highly skilled, multi-disciplinary workforce. NASA's success is built on high-performing teams that are committed to continuous learning, trust, and openness to innovation and new ideas.
- **Integrity:** NASA is committed to maintaining an environment of trust built upon honesty, ethical behavior, respect, and candor. Building trust through ethical conduct as individuals and as an organization is a necessary component of mission success.
- **Mission Success:** NASA's purpose is to carry out space exploration, scientific discovery, and aeronautics research on behalf of the Nation. Every NASA employee believes that mission success is the natural consequence of an uncompromising commitment to technical excellence, safety, teamwork, and integrity.

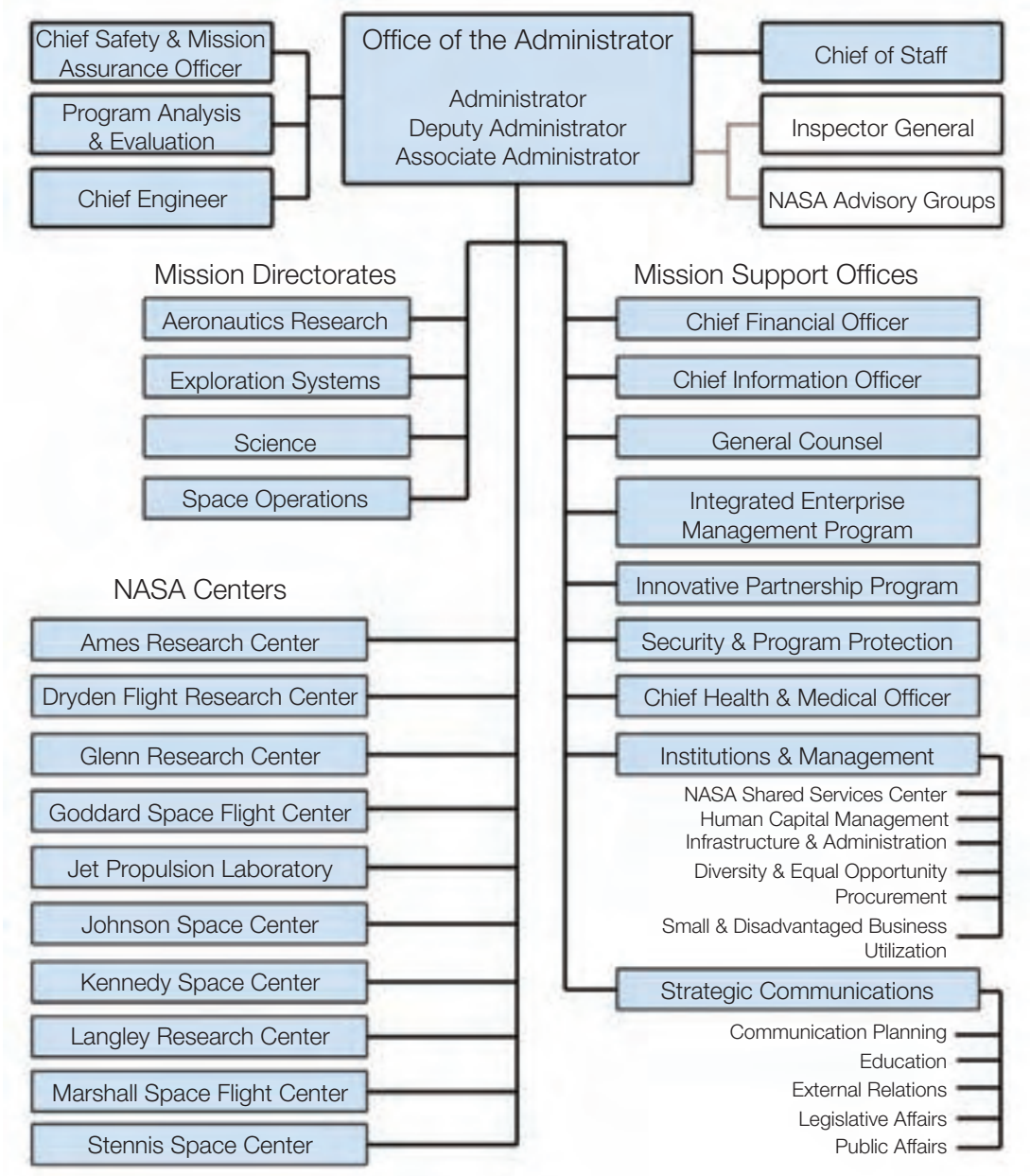
NASA's Organization

NASA is comprised of NASA Headquarters in Washington, D.C., nine Centers located around the country, and the Jet Propulsion Laboratory, a Federally Funded Research and Development Center operated under a contract with the California Institute of Technology. In addition, NASA partners with academia, the private sector, state and local governments, other federal agencies, and a number of international organizations to create an extended NASA family of civil servants, allied partners, and stakeholders. Together, this skilled, diverse group of scientists, engineers, managers, and support personnel share the Mission, Vision, and Values that are NASA.

NASA Headquarters

To achieve NASA's Mission and the Vision for Space Exploration, NASA Headquarters is organized into four Mission Directorates:

- The **Aeronautics Research Mission Directorate** conducts fundamental research in aeronautical disciplines and develops capabilities, tools, and technologies that will enhance significantly aircraft performance, environmental compatibility, and safety, as well as the capacity, flexibility, and safety of the future air transportation system.
- The **Science Mission Directorate** conducts the scientific exploration of Earth, the Sun, the rest of the solar system, and the universe. Large, strategic missions are complemented by smaller, Principal Investigator-led missions, including ground-, air-, and space-based observatories, deep-space automated spacecraft, and planetary orbiters, landers, and surface rovers. This Directorate also develops increasingly refined instrumentation, spacecraft, and robotic techniques in pursuit of NASA's science goals.
- The **Exploration Systems Mission Directorate** develops systems and supports research and technology development to enable sustained and affordable human and robotic space exploration. This Directorate will develop the robotic precursor missions, human transportation elements, and life support systems for the near-term goal of lunar exploration.
- The **Space Operations Mission Directorate** directs spaceflight operations, space launches, and space communications and manages the operation of integrated systems in low Earth orbit and beyond, including the International Space Station. This Directorate also is laying the foundation for future missions to the Moon and Mars by using the International Space Station as an orbital outpost where astronauts can gather vital information that will enable safer and more capable systems for human explorers.



Functional support for NASA initiatives comes from the Agency's Mission Support Offices. These offices focus on reducing risks to missions by implementing efficient management operations Agency-wide: adopting standard business and management tools to improve the effectiveness of cross-Agency operations; implementing innovative practices in human capital management that encourage increased teamwork, Agency-wide perspectives, and capability development; and reducing long-term operations costs by decreasing environmental liability costs.

Building Healthy NASA Centers

All NASA Centers support the Agency's space exploration objectives, scientific initiatives, and aeronautics research in addition to fulfilling their traditional responsibilities. Each Center is sized and staffed to meet its unique needs and to ensure that the skills and abilities of every employee are used fully. Each Center pursues ways to conserve resources and improve processes and procedures in ways that serve the Center's needs while contributing to

achieving NASA's Mission. And, all Centers must undertake initiatives to demonstrate the attributes of strong, healthy, productive Centers identified by NASA's Strategic Management Council:

- Clear, stable, and enduring roles and responsibilities;
- Clear program/project management leadership roles;
- Major in-house, durable spaceflight responsibility;
- Skilled, flexible, blended workforce with sufficient depth and breadth to meet NASA's challenges;
- Technically competent and value-centered leadership;
- Capable and effectively utilized infrastructure; and
- Strong stakeholder support.

Measuring NASA's Performance

Establishing Government Performance and Results Act (GPRA) Performance Measures

In February, NASA issued the *2006* NASA Strategic Plan reflecting the Agency's focus on achieving the Vision for Space Exploration through six Strategic Goals. At the same time, NASA updated the Agency's FY 2006 Performance Plan to include multi-year and annual performance metrics that NASA is pursuing in support of the new Strategic Goals.

The resulting FY 2006 Performance Plan Update also demonstrated the latest efforts toward improving the Agency's performance measurement process. NASA reduced the number of multi-year Outcomes from 78 to 37 and, by eliminating redundancies, cut the number of Annual Performance Goals (APGs) from 210 to 165. NASA also began revising the Agency's multi-year Outcomes and APGs to make them more measurable and traceable over given periods of performance and to ensure that they provide relevant and useful performance information to NASA's decision-makers, the White House, Congress, and other stakeholders.

NASA, like all research and development agencies, faces challenges in measuring and reporting annual performance progress against long-term Strategic Goals. NASA's space exploration, science, and aeronautics focus often yields unpredictable discoveries or technological breakthroughs that can enhance or impede progress in the short-term and impact the Agency's long-term goals. In fact, NASA may appear to take a step back in performance progress one year only to make greater progress the following year. NASA will continue to work toward improved performance measurements and reports in subsequent years should show increasing improvement.

Rating NASA's Performance

NASA managers calculate annually Outcome and APG performance ratings based on a number of factors, including internal and external assessments. Internally, program managers, analysts from the Office of Program Analysis and Evaluation, and review committees monitor and analyze each program's adherence to budgets, schedules, and key milestones. External advisors, like the NASA Advisory Council, the National Research Council, and the Aerospace Safety Advisory Panel, assess program content and direction. Also, experts from the science community, coordinated by the Science Mission Directorate, review NASA's progress toward meeting performance metrics under Strategic Goal 3 (Sub-goals 3A through 3D). After weighing the input from all these reviews, NASA program managers determine a program's progress toward achieving its multi-year and annual performance metrics.

In FY 2006, as part of NASA's commitment to improving the Agency's performance measurement and evaluation system, NASA analysts created PARWeb to simplify the process of collecting performance data. PARWeb provides a centralized, Web-based location for all performance ratings, narrative descriptions of performance progress and challenges, explanations of performance shortfalls, and source data to support assigned ratings. PARWeb also lays the foundation for improving NASA's ability to track historical trends for multi-year Outcomes and APGs.

NASA rates performance as follows:

Multi-year Outcome Rating Scale

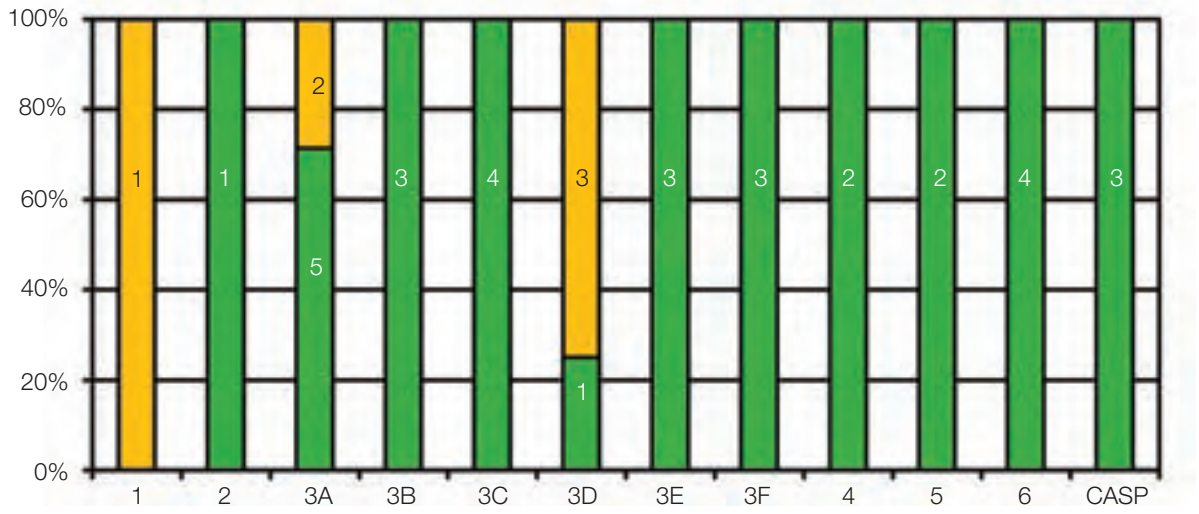
Green	NASA achieved most APGs under this Outcome and is on-track to achieve or exceed this Outcome.
Yellow	NASA made significant progress toward this Outcome, however, the Agency may not achieve this Outcome as stated.
Red	NASA failed to achieve most of the APGs under this Outcome and does not expect to achieve this Outcome as stated.
White	This Outcome was canceled by management directive or is no longer applicable based on management changes to the APGs.

APG Rating Scale

Green	NASA achieved this APG.
Yellow	NASA failed to achieve this APG, but made significant progress and anticipates achieving it during the next fiscal year.
Red	NASA failed to achieve this APG, and does not anticipate completing it within the next fiscal year.
White	This APG was canceled by management directive, and NASA is no longer pursuing activities relevant to this APG.

In FY 2006, NASA achieved 84 percent of the Agency's 37 multi-year Outcomes, as shown in the Figure 1. NASA also achieved 70 percent of the Agency's 165 APGs. NASA rated 12 percent of the Agency's APGs Yellow and 18 percent either Red or White. In previous years, NASA rated performance that exceeded expectations and measures Blue; however, NASA discontinued this rating as of FY 2006. (See Figure 2 for a summary of NASA's APG ratings for FY 2006.)

Figure 1: Summary of NASA's FY 2006 Multi-year Outcome Ratings



CASP = Cross-Agency Support Programs

Figure 2: Summary of NASA's FY 2006 APG Ratings

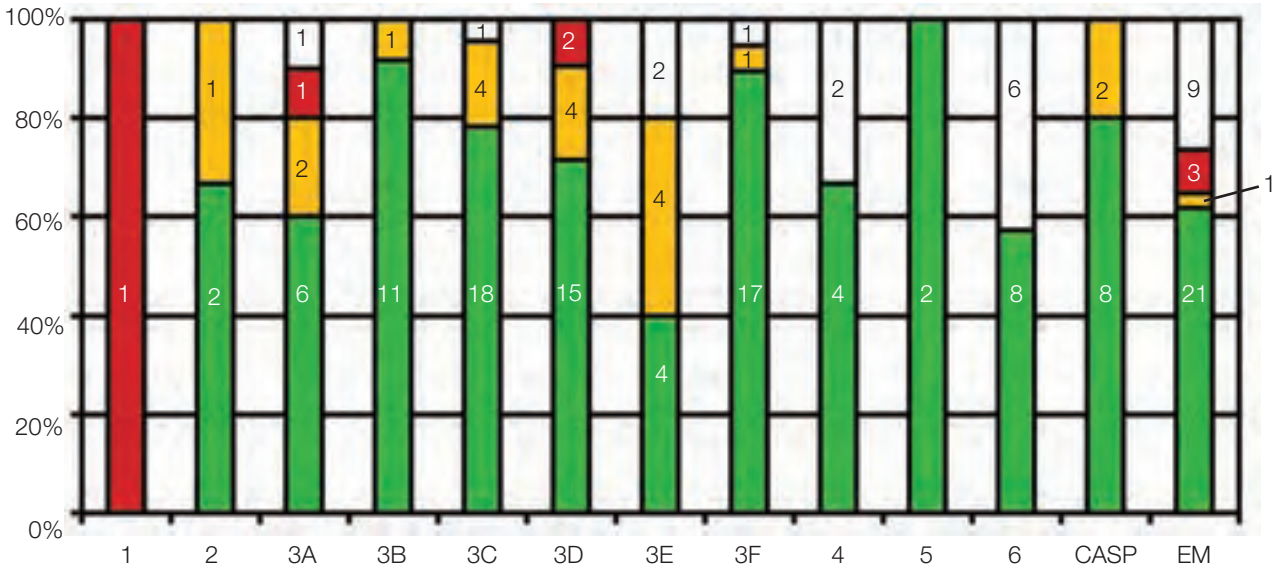
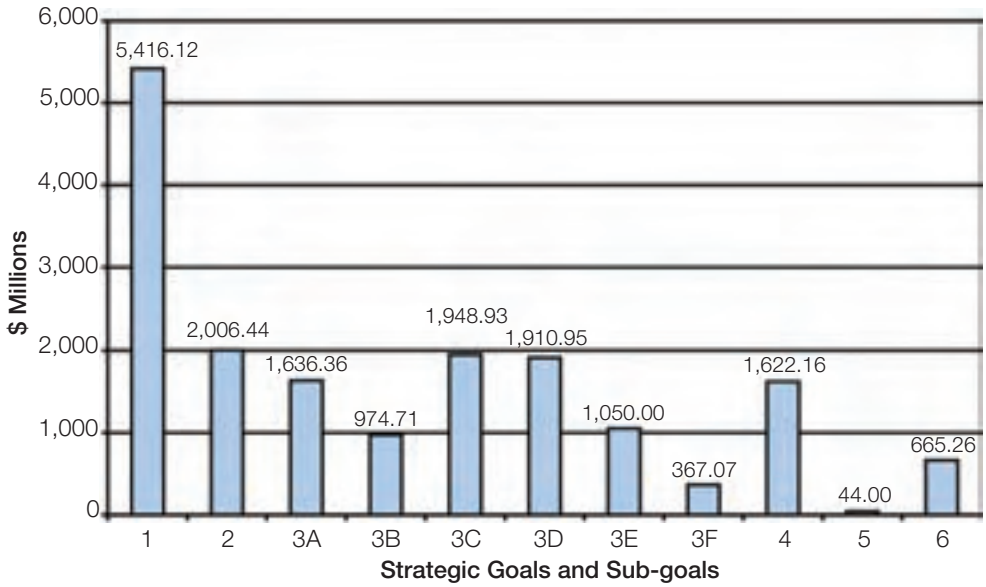


Figure 3 shows an estimate of NASA's FY 2006 cost of performance for each Strategic Goal and Sub-goal. NASA's financial structure is not based on the Strategic Goals; it is based on lines of business that reflect the costs associated with the Agency's Mission Directorate and Mission Support programs. To derive the cost of performance, NASA analysts reviewed and assigned each Agency program to a Strategic Goal (or Sub-goal, when appropriate), then estimated the expenditure based on each program's percentage of the business line reflected in that Strategic Goal (or Sub-goal, when appropriate). This method does not allow NASA to estimate cost of performance by multi-year Outcomes or APGs. However, NASA is making progress in aligning the Agency's budget and financial structure with performance, and the Agency plans to report cost of performance by multi-year Outcomes as soon as possible.

The numbers provided below, and in Part 2, are derived from the FY 2006 Statement of Net Cost included in Part 3: Financials.

Figure 3: FY 2006 Cost of Performance for NASA's Strategic Goals and Sub-goals



The "scorecard" below shows NASA's FY 2006 progress toward achieving the Agency's 37 multi-year Outcomes. Detailed information about FY 2006 performance, including ratings for APGs, rating trends, and NASA's Performance Improvement Plan, are included in Part 2: Detailed Performance Data.

FY 2006 NASA Performance Metrics		FY 2006 Rating
Strategic Goal 1: Fly the Shuttle as safely as possible until its retirement, not later than 2010.		
1.1	Assure the safety and integrity of the Space Shuttle workforce, systems and processes, while flying the manifest.	Yellow
Strategic Goal 2: Complete the International Space Station in a manner consistent with NASA's International Partner commitments and the needs of human exploration.		
2.1	By 2010, complete assembly of the U.S. On-orbit segment; launch International Partner elements and sparing items required to be launched by the Shuttle; and provide on-orbit resources for research to support U.S. human space exploration.	Green
Strategic Goal 3: Develop a balanced overall program of science, exploration, and aeronautics consistent with the redirection of the human spaceflight program to focus on exploration.		
Sub-goal 3A: Study Earth from space to advance scientific understanding and meet societal needs.		
3A.1	Progress in understanding and improving predictive capability for changes in the ozone layer, climate forcing, and air quality associated with changes in atmospheric composition.	Green
3A.2	Progress in enabling improved predictive capability for weather and extreme weather events.	Green
3A.3	Progress in quantifying global land cover change and terrestrial and marine productivity, and in improving carbon cycle and ecosystem models.	Green
3A.4	Progress in quantifying the key reservoirs and fluxes in the global water cycle and in improving models of water cycle change and fresh water availability.	Yellow
3A.5	Progress in understanding the role of oceans, atmosphere, and ice in the climate system and in improving predictive capability for its future evolution.	Yellow
3A.6	Progress in characterizing and understanding Earth surface changes and variability of Earth's gravitational and magnetic fields.	Green
3A.7	Progress in expanding and accelerating the realization of societal benefits from Earth system science.	Green
Sub-goal 3B: Understand the Sun and its effects on Earth and the solar system.		
3B.1	Progress in understanding the fundamental physical processes of the space environment from the Sun to Earth, to other planets, and beyond to the interstellar medium.	Green
3B.2	Progress in understanding how human society, technological systems, and the habitability of planets are affected by solar variability and planetary magnetic fields.	Green
3B.3	Progress in developing the capability to predict the extreme and dynamic conditions in space in order to maximize the safety and productivity of human and robotic explorers.	Green
Sub-goal 3C: Advance scientific knowledge of the solar system, search for evidence of life, and prepare for human exploration.		
3C.1	Progress in learning how the Sun's family of planets and minor bodies originated and evolved.	Green
3C.2	Progress in understanding the processes that determine the history and future of habitability in the solar system, including the origin and evolution of Earth's biosphere and the character and extent of prebiotic chemistry on Mars and other worlds.	Green
3C.3	Progress in identifying and investigating past or present habitable environments on Mars and other worlds, and determining if there is or ever has been life elsewhere in the solar system.	Green
3C.4	Progress in exploring the space environment to discover potential hazards to humans and to search for resources that would enable human presence.	Green
Sub-goal 3D: Discover the origin, structure, evolution, and destiny of the universe, and search for Earth-like planets.		
3D.1	Progress in understanding the origin and destiny of the universe, phenomena near black holes, and the nature of gravity.	Green

FY 2006 NASA Performance Metrics		FY 2006 Rating
3D.2	Progress in understanding how the first stars and galaxies formed, and how they changed over time into the objects recognized in the present universe.	Yellow
3D.3	Progress in understanding how individual stars form and how those processes ultimately affect the formation of planetary systems.	Yellow
3D.4	Progress in creating a census of extra-solar planets and measuring their properties.	Yellow
Sub-goal 3E: Advance knowledge in the fundamental disciplines of aeronautics, and develop technologies for safer aircraft and higher capacity airspace systems.		
3E.1	By 2016, identify and develop tools, methods, and technologies for improving overall aircraft safety of new and legacy vehicles operating in the Next Generation Air Transportation System (projected for the year 2025).	Green
3E.2	By 2016, develop and demonstrate future concepts, capabilities, and technologies that will enable major increases in air traffic management effectiveness, flexibility, and efficiency, while maintaining safety, to meet capacity and mobility requirements of the Next Generation Air Transportation System.	Green
3E.3	By 2016, develop multidisciplinary design, analysis, and optimization capabilities for use in trade studies of new technologies, enabling better quantification of vehicle performance in all flight regimes and within a variety of transportation system architectures.	Green
Sub-goal 3F: Understand the effects of the space environment on human performance, and test new technologies and countermeasures for long-duration human space exploration.		
3F.1	By 2008, develop and test candidate countermeasures to ensure the health of humans traveling in space.	Green
3F.2	By 2010, identify and test technologies to reduce total mission resource requirements for life support systems.	Green
3F.3	By 2010, develop reliable spacecraft technologies for advanced environmental monitoring and control and fire safety.	Green
Strategic Goal 4: Bring a new Crew Exploration Vehicle into service as soon as possible after Shuttle retirement.		
4.1	No later than 2014, and as early as 2010, transport three crewmembers to the International Space Station and return them safely to Earth, demonstrating an operational capability to support human exploration missions.	Green
4.2	No later than 2014, and as early as 2010, develop and deploy a new space suit to support exploration, that will be used in the initial operating capability of the Crew Exploration Vehicle.	Green
Strategic Goal 5: Encourage the pursuit of appropriate partnerships with the emerging commercial space sector.		
5.1	Develop and demonstrate a means for NASA to purchase launch services from emerging launch providers.	Green
5.2	By 2010, demonstrate one or more commercial space services for ISS cargo and/or crew transport.	Green
Strategic Goal 6: Establish a lunar return program having the maximum possible utility for later missions to Mars and other destinations.		
6.1	By 2008, launch a Lunar Reconnaissance Orbiter (LRO) that will provide information about potential human exploration sites.	Green
6.2	By 2012, develop and test technologies for in-situ resource utilization, power generation, and autonomous systems that reduce consumables launched from Earth and moderate mission risk.	Green
6.3	By 2010, identify and conduct long-term research necessary to develop nuclear technologies essential to support human-robotic lunar missions and that are extensible to exploration of Mars.	Green
6.4	Implement the space communications and navigation architecture responsive to Science and Exploration mission requirements.	Green
Cross-Agency Support Programs		
Education		
ED-1	Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals through a portfolio of programs.	Green

FY 2006 NASA Performance Metrics		FY 2006 Rating
Advanced Business Systems (Integrated Enterprise Management Program)		
IEM-2	Increase efficiency by implementing new business systems and reengineering Agency business processes.	Green
Innovative Partnerships Program		
IPP-1	Promote and develop innovative technology partnerships among NASA, U.S. industry, and other sectors for the benefit of Agency programs and projects.	Green

Program Assessment Rating Tool (PART)

OMB developed the PART in 2002 to assess federal agency programs and projects and to identify their strengths and weaknesses. OMB evaluates NASA's programs through PART in a three-year cycle, assessing approximately one-third of the Agency's budget areas, or Themes, each year. In FY 2006, OMB assessed three Themes:

- Solar System Exploration received an "Effective" rating (the highest rating possible) for setting ambitious goals, achieving results, and being well managed and efficient;
- Constellation Systems received an "Adequate" rating for a major program management deficiency related to Agency-wide problems with integrating NASA's new systems for financial and administrative management and due to the relative newness of the program and the limited baselines for comparison and evaluation; and
- The Integrated Enterprise Management Program received a "Moderately Effective" rating for setting ambitious goals. However, the program still needs to revise some of the accountability processes to ensure consistent program effectiveness.

NASA tracks and implements a series of follow-on actions designed to improve program performance based on current and past PART assessments. Part 2: Detailed Performance Data includes detailed PART ratings by program assessment areas. Appendix C contains NASA's follow-up actions to Themes reviewed in FY 2005. OMB's recommendations for the FY 2006 assessments were not available for inclusion in the FY 2006 Performance and Accountability Report.

President's Management Agenda (PMA)

While GPRA and PART focus on Agency and program performance, the President's Management Agenda (PMA) commits the Executive Branch of the federal government to a series of reforms to improve efficiencies and effectiveness in the management of federal programs. PMA focuses on individual agency performance in six government-wide management areas: Human Capital, Competitive Sourcing, Improving Financial Performance, E-Government, Budget and Performance Integration, and Real Property Asset Management. OMB oversees the PMA efforts, negotiates performance goals with each agency, and rates agency performance quarterly. The PMA scores from each agency are rolled up into an Executive Branch Management Scorecard that tracks government-wide status and progress in all PMA focus areas.

The table below shows NASA's PMA status and progress for FY 2006 and the three previous fiscal years.

NASA's PMA Scorecard				
	FY 2006	**FY 2005**	**FY 2004**	**FY 2003**
Human Capital				
Status	Green	Green	Green	Yellow
Progress	Green	Yellow	Green	Green
Competitive Sourcing				
Status	Green	Green	Yellow	Red
Progress	Green	Green	Green	Green
Improving Financial Performance				
Status	Red	Red	Red	Red
Progress	Yellow	Red	Red	Green
E-Government				
Status	Red	Yellow	Green	Red
Progress	Red	Yellow	Green	Green
Budget and Performance Integration				
Status	Green	Green	Green	Yellow
Progress	Green	Yellow	Green	Green
Real Property Asset Management				
Status	Green	Yellow	Red	n/a
Progress	Yellow	Green	Yellow	n/a

Major Program Annual Reports

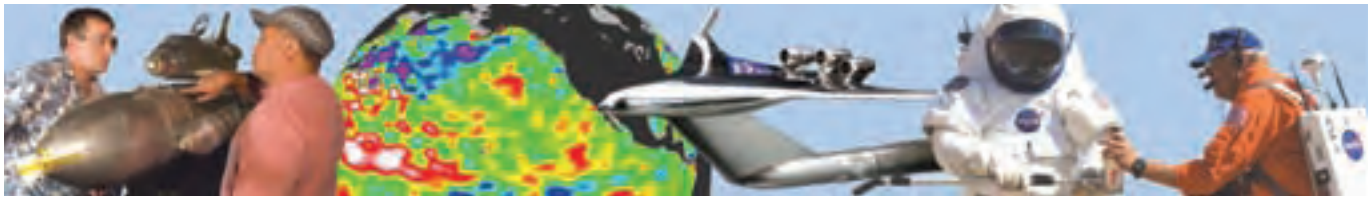
The *NASA Authorization Act of 2005* mandates that NASA submit Major Program Annual Reports with the Agency's fiscal year budget request. Each Major Program Annual Reports begins with a baseline report for every new major program or project, the program or project's purpose, key technical parameters to fulfill that purpose, key milestones, lifecycle cost commitment, estimated development costs, and risks to the program or project.

In FY 2006, as part of the FY 2007 Budget Estimates, NASA provided baseline reports for the following programs and projects:

- Integrated Enterprise Management Program: Core Financial project, including the follow-on SAP Version Update effort to improve the Agency's SAP Core Financial software;
- Science Mission Directorate: Dawn, the Gamma-ray Large Area Space Telescope (GLAST), Herschel, Hubble Space Telescope Servicing Mission 4, Kepler, Mars Phoenix, the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparation Project, Solar Dynamics Observatory (SDO), and the Solar Terrestrial Relations Observatory (STEREO); and
- Space Operations Mission Directorate: International Space Station.

NASA will monitor identified baseline cost and key milestones to assure that each program/project does not exceed the estimated cost by 15 percent and/or does not miss a key milestone by more than six months. If either of these thresholds is exceeded, NASA will update Congress with the reasons and the impacts of the cost growth or the schedule delay.

Performance Overview



Progress Toward Achieving NASA's Strategic Goals

A Guide to Performance Overviews

The following Performance Overviews describe NASA's Strategic Goals and Sub-goals. The discussions include performance achievement highlights and challenges in FY 2006.

Introduction and Reaping Benefits

The introduction provides a general overview of the Strategic Goal or Sub-goal and explains NASA's rationale for pursuing each. The benefits section discusses how each Strategic Goal or Sub-goal serves the public, the Nation, the Vision for Space Exploration, and NASA's Mission.

In the upper right corner is a box displaying the cost of performance for the Strategic Goal or Sub-goal and the responsible Mission Directorate. (Note: The cost of performance is an estimate based on NASA's FY 2006 Statement of Net Cost included in Part 3: Financials. This estimate does not include cost obligations deferred to subsequent fiscal years. A description of how NASA obtains the cost of performance is included in Measuring NASA's Performance.)

Highlighting Achievements

This section highlights the top performance successes during the fiscal year. It also identifies management issues, such as reorganizations, that enabled the Agency to achieve these successes.

Confronting Challenges

This section highlights the major challenges NASA faced during FY 2006 and plans to mitigate or overcome the challenges.

Moving Forward

This section describes activities planned for the next few years that will contribute to the successful achievement of each Strategic Goal or Sub-goal. It also addresses the obstacles that NASA may have to overcome in the near future to achieve the Vision.

Strategic Goal 1: Fly the Shuttle as safely as possible until its retirement, not later than 2010.

Cost of Performance (in millions)
$5,416.12
Responsible Mission Directorate
Space Operations

The Space Shuttle has supported NASA's Mission for over 25 years, carrying crews and cargo to low Earth orbit, performing repair, recovery, and maintenance missions on orbiting satellites, providing a platform for conducting science experiments, and supporting construction of the International Space Station (ISS). NASA will retire the Shuttle fleet by 2010. Until then, the Agency will demonstrate NASA's most critical value—safety—by promoting engineering excellence, maintaining realistic flight schedules, and fostering internal forums where mission risks and benefits can be discussed and analyzed freely.

Reaping Benefits

The Shuttle is recognized around the world as a symbol of America's space program and the Nation's commitment to space exploration. NASA's Space Shuttle Program, and the Shuttle itself, have inspired generations of schoolchildren to pursue dreams and careers in science, technology, engineering, and mathematics. The Space Shuttle Program also provides direct benefits to the Nation by advancing national security and economic interests in space and spurring technology development in critical areas such as navigation, computing, materials, and communications. Furthermore, due to its heavy-lift capacity, the Shuttle is the only vehicle capable of completing assembly of the ISS in a manner consistent with NASA's international partnership commitments and exploration research needs. The remaining Shuttle flights will be dedicated to ISS construction and a Hubble Space Telescope service mission.

A primary public benefit of retiring the Shuttle is to redirect resources toward new programs, such as the Orion Crew Exploration Vehicle and the Ares launch vehicles, needed to carry out the Vision. NASA will use the knowledge and assets developed over nearly three decades of Shuttle operations to build a new generation of vehicles designed for missions beyond low Earth orbit. When NASA retires the Shuttle, the Agency will direct Shuttle personnel, assets, and knowledge toward the development and support of new hardware and technologies necessary to achieve the Vision. For the American public, this means continuity in our access to space and sustained U.S. leadership in technology development and civilian space exploration.

Highlighting Achievements

The most significant activities in FY 2006 for Strategic Goal 1 were the successful flights of STS-121 and STS-115:

- NASA celebrated Independence Day 2006 by launching Shuttle *Discovery* (STS-121), the first launch NASA ever conducted on the July 4 holiday. The second of two test flights (which include STS-114 in July 2005), STS-121 validated the improvements NASA made to the Shuttle system since the loss of *Columbia* in 2003. During the mission, *Discovery* crewmembers conducted a series of hardware and procedural tests and delivered several tons of supplies to the ISS. The mission also delivered Flight Engineer Thomas Reiter to the ISS, returning the ISS crew size to three members.

United Space Alliance technician Erin Schlichenmaier uses a flashlight to inspect tile repair on *Discovery*'s underside in November 2005. In preparation for STS-121, technicians replaced older Shuttle tiles around the main landing gear doors, external tank doors, and nose landing gear doors with a new type of tile called BRI-18. The new tiles are more impact resistant than previous designs. Technicians also developed a new procedure to ensure that gap fillers, which fill the tiny gaps between tiles, do not protrude and pose a hazard during the Shuttle's re-entry into Earth's atmosphere. During the STS-114 mission in 2005, a crewmember conducted a spacewalk to remove a protruding piece of gap filler spotted on *Discovery*'s underside. (NASA)

- *Atlantis* (STS-115) launched on September 9, marked a return to sustained Shuttle operations, placing NASA on track to complete assembly of the ISS by Shuttle retirement in 2010. *Atlantis* delivered to the ISS the P3/P4 truss, which will provide a quarter of the power, data, and communications services needed to operate the completed ISS. During the mission, *Atlantis* crewmembers conducted spacewalks—the most complex ever conducted—to attach the truss and the Solar Alpha Rotary Joint, a wagon wheel-shaped joint that allows the solar arrays attached to the truss to turn toward the Sun.

Confronting Challenges

The Space Shuttle Program faces two main challenges. First, NASA must maintain the skilled workforce and critical assets needed to safely complete the Shuttle manifest. Second, NASA must manage the process of identifying, transitioning, and dispositioning the resources that support the Shuttle in anticipation of the Shuttle's retirement.

The Shuttle transition and phase-out effort will be complex and challenging, especially since it will happen at the same time as the Shuttle is set to carry out the most complicated sequence of flights ever attempted. Over the next four years, the Shuttle will carry tons of hardware to the ISS, where astronauts and cosmonauts will conduct nearly 80 spacewalks to assemble, check out, and maintain the orbiting facility. NASA also plans to conduct a fifth servicing mission to the Hubble Space Telescope to repair critical subsystems and improve Hubble's astronomical instruments.

The Space Shuttle Program occupies 640 facilities and uses over 900,000 pieces of equipment. The total equipment value is over $12 billion, located in hundreds of government and contractor facilities across the United States. The total facilities value is approximately $5.7 billion, which accounts for approximately one-fourth of the value of the Agency's total facility inventory. NASA currently has more than 1,500 active suppliers and 3,000 to 4,000 qualified suppliers located throughout the country. Retiring these assets and facilities or transitioning them to new human exploration efforts is a formidable challenge. NASA must leverage strategically the existing human spaceflight workforce, hardware, and infrastructure to ensure safe Shuttle missions while simultaneously preparing to meet future needs. NASA uses a number of working groups and control boards to monitor and control the transition process, including the Transition Control Board, the Joint Integration Control Board, and the Headquarters Transition Working Group. The Space Shuttle Program manager executes risk management responsibilities through the commit-to-flight process, the Shuttle Engineering Review Board, and Regular Program Requirements Control Board. These boards and processes are designed to manage and reduce the risks associated with both flying the Shuttle and transitioning from Shuttle to other exploration vehicles.

In March 2006, NASA engineers tested a three-percent-size model of the Space Shuttle at Ames Research Center's Unitary Wind Tunnel Complex to help decide whether they should remove the Shuttle's protuberance air load (PAL) ramps from the external tank for the STS-121 launch. During the launch of STS-114 in July 2005, a large piece of insulation foam fell from the PAL ramp area. The results of the wind tunnel tests indicated that the Shuttle team could remove the PAL ramps, leaving in place the smaller ice–frost ramps, and proceed with the launch as planned. (NASA)

Moving Forward

NASA plans to assemble the ISS using the minimum number of Shuttle flights necessary to complete assembly and ensure a safe transition to new capabilities. The Agency also will conduct a fifth servicing mission to the Hubble Space Telescope. At the same time, NASA will phase out the Shuttle and ensure a smooth transition of the workforce and critical assets to new requirements.

Strategic Goal 2: Complete the International Space Station in a manner consistent with NASA's International Partner commitments and the needs of human exploration.

Cost of Performance (in millions)
$2,006.44
Responsible Mission Directorate
Space Operations

Built and operated using state of the art science and technology, the International Space Station (ISS) is a vital part of NASA's program of exploration. The ISS provides an environment for developing, testing, and validating the next generation of technologies and processes needed to support the Nation's exploration program and achievement of the Vision for Space Exploration.

Reaping Benefits

The ISS is a testbed for exploration technologies and processes. Its equipment and location provide a one-of-a-kind platform for Earth observations, microgravity research, and investigations of the long-term effects of the space environment on human beings. The ISS also enables research in fundamental physics and biology, materials sciences, and medicine. Crewmembers test processes for repairing equipment in microgravity, conducting spacewalks, and keeping systems operational over long periods of time—capabilities critical to future missions.

When completed, the ISS will be the largest crewed spacecraft ever built. Many nations provide the resources and technologies that keep the ISS flying, and these international partnerships have increased cooperation and goodwill among participating nations.

Highlighting Achievements

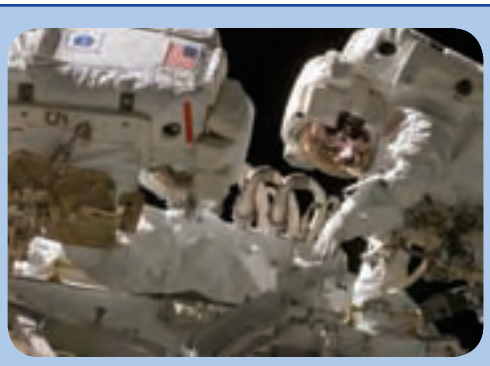
On November 2, 2005, Expedition 12 Commander William McArthur and Flight Engineer Valery Tokarev, both of whom had been aboard the ISS since October 10, 2005, celebrated five years of continuous human presence in low Earth orbit aboard the ISS. Throughout their stay, the Expedition 12 crew focused primarily on ISS operations and maintenance tasks. They also conducted individual experiments, adding to the more than 4,000 hours of research time conducted by past expeditions. Projects in FY 2006 included the following:

- As part of Education Payload Operations, the crew videotaped themselves conducting activities in the near-weightless environment of the ISS to demonstrate science, technology, engineering, mathematics, and geography principles to grade-school students.
- In February 2006, McArthur and Tokarev released into orbit an old Russian Orlan spacesuit outfitted with a special radio transmitter and other gear as part of a Russian experiment called SuitSat. The spacesuit flew free from the ISS like a satellite in orbit for several weeks of scientific research and communications tracking by amateur radio operators.
- McArthur conducted experiments for the Protein Crystal Growth Monitoring by Digital Holographic Microscope, or PromISS, using the Microgravity Science Glovebox. This

Astronaut Jeffrey Williams, Expedition 13 NASA science officer, checks the Beacon/Beacon Tester for the Synchronized Position Hold, Engage, Reorient, Experimental Satellites (SPHERES) on August 19, 2006. SPHERES, which uses robotic mini-satellites, tests the basics of formation flight and autonomous docking that should be useful in future multiple spacecraft formation flying. The first satellite arrived at the ISS by Progress spacecraft in April 2006, and STS-121 delivered the second, blue satellite. A third, yellow satellite will launch on STS-116. Although the SPHERES satellites have been tested on Earth, 2006 marks the first tests in space. (NASA)

experiment used a holographic microscope to study how the near-weightless environment aboard the ISS affects protein crystal growth to help scientists better understand the role of proteins in diseases.

- The STS-121 mission in July 2006 delivered the oxygen generation system rack, which is part of the regenerative environmental control and life support system. This rack eventually will allow the ISS to accommodate six crewmembers and will help NASA develop and validate life support technology for use during long-duration human space missions. Shuttle astronauts Michael Fossum and Piers Sellers repaired the ISS's mobile transporter rail car, which allows the remote manipulator arm, or Canadarm-2, to move along the ISS's truss elements, extending the arm's reach so that it can aid future ISS construction. During another extravehicular activity, the two astronauts attached a spare pump module that helps transport liquid ammonia through the ISS's cooling system. STS-121 also delivered Flight Engineer Thomas Reiter, returning the ISS crew complement to three members.



On September 12, 2006, STS-115 astronauts Joseph Tanner (left) and Heidemarie Stefanyshyn-Piper conduct the first of three spacewalks to attach the P3/P4 truss to the International Space Station. (NASA)

- In September, STS-115 crewmembers attached the newly delivered P3/P4 truss, doubling the ISS's power and capability. The P3/P4 truss includes the new Solar Alpha Rotary Joint. This joint, combined with the gimbal assemblies on the solar arrays, allows the massive solar arrays to remain pointed toward the Sun as the ISS orbits. These and other additions to be delivered on future missions prepare the ISS to receive new modules, including International Partner modules, and to accommodate larger crews.

Confronting Challenges

The important role that the Space Shuttle plays in the construction and maintenance of the ISS means that the successful completion of ISS assembly is dependent on the Space Shuttle Program. Each Shuttle mission is critical to the completion of ISS. NASA developed Shuttle schedules and manifests to assure that each Shuttle flight is maximized. The Space Operations Mission Directorate also is seeking alternate transportation options for crew and cargo to relieve the burden placed on the Shuttle.

NASA enjoys the benefits of partnerships with the other nations contributing to the ISS. These partnerships enhance the Agency's ability to achieve NASA's Strategic Goals while also benefiting partner nations. However, international space agency partnerships do not exist in a vacuum, and there are multiple risks involved in these partnerships. NASA's ability to maintain international partnerships even as world conditions and international relationships change is important to the success of the ISS.

Moving Forward

The resumption of Shuttle flights will allow NASA to complete construction of the ISS, increase the crewmember size, and demonstrate the advanced capabilities of the regenerative environmental control and life support system. The return to planned ISS activities also helps NASA achieve on schedule important research milestones for human health and life support. The *NASA Authorization Act of 2005* designated the ISS as a National Laboratory. NASA currently is developing the plan required by Congress that will describe the implementation of National Laboratory status for the ISS.

Goal 3: Develop a balanced overall program of science, exploration, and aeronautics consistent with the redirection of the human spaceflight program to focus on exploration.

Strategic Goal 3 encompasses all basic research programs that enable, and are enabled by, NASA's exploration activities. To ensure a balanced focus that addresses and achieves all objectives of the Vision for Space Exploration and NASA's Mission, the Agency established six Sub-goals supporting Goal 3:

- Sub-goal 3A: Study Earth from space to advance scientific understanding and meet societal needs.
- Sub-goal 3B: Understand the Sun and its effects on Earth and the solar system.
- Sub-goal 3C: Advance scientific knowledge of the solar system, search for evidence of life, and prepare for human exploration.
- Sub-goal 3D: Discover the origin, structure, evolution, and destiny of the universe, and search for Earth-like planets.
- Sub-goal 3E: Advance knowledge in the fundamental disciplines of aeronautics, and develop technologies for safer aircraft and higher capacity airspace systems.
- Sub-goal 3F: Understand the effects of the space environment on human performance, and test new technologies and countermeasures for long-duration human space exploration.

All four Mission Directorates contribute to these Sub-goals.

Highlighting Achievements

NASA made excellent progress toward achieving Strategic Goal 3 during FY 2006. The Science Mission Directorate, which manages work under Sub-goals 3A through 3D, celebrated many achievements, including the successful completion of several missions: Stardust, which returned samples from comet Wild 2; Gravity Probe–B (GPB), which tested Einstein's theory of general relativity; and the Topography Experiment for Ocean Circulation (TOPEX)/Poseidon mission, which revolutionized the way scientists study Earth's oceans. In July, NASA returned the International Space Station crew size to three members and the Shuttle returned to regular operations in September, increasing flight research opportunities in human health and performance and fundamental physics and biology. The Aeronautics Research Mission Directorate conducted a major reorganization that aligned its programs with NASA's new priorities. Exploration Systems, Science, and Space Operations also streamlined their organizations to strengthen and enhance programmatic coordination, direction, and accountability.

Confronting Challenges

Achieving Sub-goals 3A through 3F will demand that NASA confront unique challenges specific to each Sub-goal. However, NASA also faces some over-arching challenges that impinge on more than one Sub-goal. For example, the Science Mission Directorate must predict technology development and mission implementation life-cycle costs that are key to estimating budget needs across the life of a project. This challenge is apparent in large, flagship missions, as well as in medium and small missions. The Science Mission Directorate also is challenged by the need to maximize the science return for each mission while maintaining an acceptable level of implementation risk and meeting cost and schedule objectives.

The challenge of maximizing science while maintaining cost and schedule objectives is exacerbated by the need to develop one-of-a-kind spacecraft that require cutting-edge technologies and engineering processes. Because NASA and Agency partners are doing something for the first time, costs are rarely fully predictable. A key obstacle in achieving program success is being able to mature the required technologies early enough in the life of the mission to keep the life-cycle costs reasonable and predictable. If NASA and Agency partners take too long to tackle the technology challenges, schedule delays will occur later in the mission when delays are even more costly.

The Agency constantly strives to do a better job of predicting accurately total lifecycle costs. In order to do this, NASA aims to have enough reserves, while conserving resources, at mission confirmation. In addition, the

Science Mission Directorate is conducting studies to analyze best practices from selected past missions in the small, medium, and large mission cost categories.

Another challenge confronting NASA's Science missions is the future availability and cost of launch services. As retirement looms for medium-class expendable launch vehicles like the Delta II, expendable launch vehicles are evolving toward larger, more expensive launchers like the Delta 4 and Atlas 5. These larger launchers provide advantages in lift capabilities for larger payloads, but are more expensive per pound of payload for small- and medium-sized payloads, since NASA would be paying for unneeded lift capabilities.

In addition, technical issues associated with available expendable launch vehicles have led to launch delays and additional costs for several missions. To address the challenge, NASA has undertaken a study to consider options the Agency might pursue to strengthen the launch vehicle portfolio, including using alternate launch providers.

The following discussions of each Sub-goal include background, highlights, and challenges specific to that Sub-goal.

Sub-goal 3A: Study Earth from space to advance scientific understanding and meet societal needs.

Cost of Performance (in millions)
$1,636.36
Responsible Mission Directorate
Science

Earth is a dynamic system. Its land, oceans, atmosphere, climate, and gravitational fields are changing constantly. Some of these changes, especially short-duration and localized phenomena like hurricanes and earthquakes, are big and can pose hazards to humans around the world. Other changes, like climate variability, take longer to have an effect and are revealed through long-term, intensive research. NASA's Earth Science Division helps researchers better understand the causes and consequences of these changes through data gathered by Earth-observing satellites, aircraft, and balloons. Using advanced computer systems, program scientists analyze and model the data into useful Earth science information and distribute it to end users around the world.

NASA's Earth Science Division partners with other government agencies, academia, non-profit organizations, industry, and international organizations to share data and analyses that will help researchers better understand and predict the effects of Earth system events, changes, and interactions. Improved understanding and predictive ability enables end users, especially policy makers, to ameliorate harmful impacts of events and changes to the Earth system.

Reaping Benefits

NASA's Earth Science Division is central to three Presidential initiatives that serve the public:

- The Climate Change Research Initiative, established in 2001 to study global climate change and to provide a forum for public debate and decision-making about how the United States monitors and responds to climate change;
- The Global Earth Observation System of Systems, a multinational effort to coordinate existing and new Earth observation hardware and software to supply free data and information for the benefit of humanity and the environment; and
- The U.S. Ocean Action Plan, released in 2004 as part of an Administration effort to ensure that benefits derived from oceans and other bodies of water will be available to future generations.

To support these initiatives, NASA and the Agency's partners conduct vital research that helps the Nation manage environmental and agricultural resources and prepare for natural disasters. In the course of conducting this research, NASA applies the resulting data and knowledge with the Agency's operational partners to improve their decision making in societal need areas such as public health, aviation, water management, air quality, and energy.

The Earth Science Program also helps NASA achieve the Agency's other Strategic Goals and Mission:

- Earth observing satellites provide meteorological information used by the National Oceanic and Atmospheric Administration (NOAA) and the Department of Defense in providing weather forecasts that help NASA plan launches and landings. At the end of August 2006, satellites indicated that Tropical Storm Ernesto would make landfall in Florida, giving NASA time to review the launch of Space Shuttle *Atlantis* and postpone it until early September.
- The Earth Science Division develops instruments for Earth observation that, with modification, can help NASA explore other planets. For example, instruments that study chemicals in Earth's atmosphere can be adapted to study the atmospheres of planets throughout the solar system.

Highlighting Achievements

Using data from the first-ever gravity survey by the twin Gravity Recovery and Climate Experiment (GRACE) satellites, scientists concluded this year that the mass of the Antarctic ice sheet has decreased significantly since 2002, providing further evidence that observed warming in polar regions is affecting ice mass. The loss, mostly from the West Antarctic ice sheet, was enough to raise sea levels around the world by about 0.05 inches. This loss primarily

is a result of increased flow of some major outlet glaciers, which drain the ice sheet, in response to the melting of floating ice shelves where these outlet glaciers meet the sea. Historically, these ice shelves have buttressed the ice and slowed its discharge.

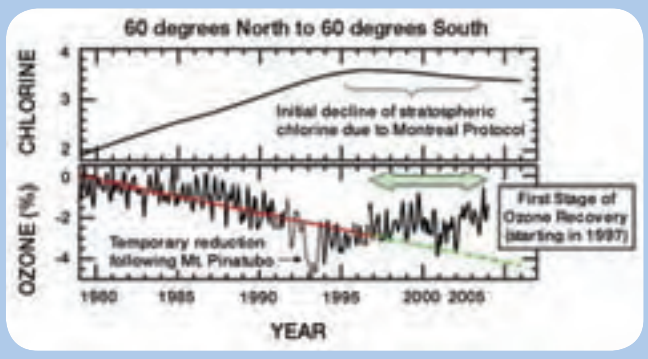
In the past, scientists had difficulty measuring Antarctica's ice sheet because of its size and complexity. They combined various measuring techniques, but the results suffered from a lack of data in critical regions. GRACE overcomes these difficulties by tracking minute changes in Earth's gravity field resulting from regional changes in the distribution of mass. In addition, NASA's Ice, Cloud, Elevation, and Land Satellite (ICESat) provides detailed information on the spatial structure and magnitude of ice sheet growth and shrinkage, providing important insight into the nature of ice changes. Together, the two missions constitute a powerful capability for understanding how ice sheets contribute to rising sea levels.

This photo shows the calving front, or break-off point into the ocean, of the Helheim Glacier, located in southeast Greenland. This glacier, which shows high calving activity associated with faster glacier flow, is now one of the fastest moving glaciers in the world. (NASA)

At the other end of the globe, ICESat, GRACE, and other missions show that ice loss has increased in the last few years, as compared to estimates made in the 1990s obtained from satellite radar altimetry and airborne laser surveys of ice-elevation changes. Satellite observations of Greenland indicate that melt rates have increased about 30 percent since 1979. At the same time, data from the Terra satellite and Landsat show a remarkable increase in flow rates of some of Greenland's major outlet glaciers, increasing the rate that ice is draining from the ice sheet and dumping into the ocean in the form of calving icebergs. Like in Antarctica, this acceleration is largely a result of the melting and break-up of floating ice "tongues" at the front of these glaciers. However, unlike Antarctica, which experiences relatively little surface melt, some acceleration in Greenland results from summer surface melt water penetrating the ice sheet and lubricating the ice/bedrock interface at the bottom of the ice sheet. Over time, the ice sheet's melt will contribute significantly to global sea levels. Aircraft and radar altimetry data also reveal that the ice sheet is growing at its higher, colder interior, most likely a result of increased snowfall, much like the East Antarctic ice sheet.

In August 2006, a study using NASA and NOAA data indicates that the decline in Earth's protective ozone layer outside the polar regions has not continued. The study team analyzed 25 years of ozone observations made at different altitudes in the stratosphere (the second layer of atmosphere, which contains about 90 percent of atmospheric ozone) by balloons, ground-based instruments, and five NASA/NOAA satellites. The results showed that ozone column amounts outside of the polar regions stopped thinning around 1997 and are remaining approximately stable, although significant recovery has not yet taken place. The data also showed that the abundance of human-produced, ozone-destroying gases, such as chlorofluorocarbons, peaked between 1993 and 1997 and is now declining.

The study team compared observation data taken from different altitudes with computer predictions, which combined measured variations in human-produced, ozone-destroying chemicals with other factors, such as sunspot activity, that can affect ozone levels. The results indicate that the 1987 international Montreal Protocol, which phased out over the course of more than a decade the production and use of ozone-depleting compounds, is succeeding in stopping further loss of ozone in the stratosphere.



In this set of graphs, NASA/NOAA satellite data shows the rise in stratospheric chlorine (top) and a corresponding decline in ozone layer thickness from 1979 to 1997. As stratospheric chlorine declined in response to enactment of the Montreal Protocol, the rate of ozone destruction decreased to the point at which there was little or no change with time. (NASA)

However, the decline in levels of these ozone-depleting compounds in the stratosphere will be gradual, and full recovery of the ozone layer will take significant time. A related study carried out by NASA suggests that full recovery of ozone over the Antarctic will not take place until approximately 2065.

Confronting Challenges

NASA delayed the CloudSat/CALIPSO joint launch several times due to technical problems with the Delta II launch vehicle and due to a strike by personnel needed to support the launch. Such delays place added stress on tight mission budgets and schedules. The Earth Science Division is working with the Space Operations Mission Directorate to manage launch provider options.

Moving Forward

In the next couple of years, NASA will launch a number of advanced Earth observation satellites:

- Measurements taken by the Orbiting Carbon Observatory (OCO), scheduled for launch in 2008, will help researchers better understand the human and natural processes controlling atmospheric carbon dioxide, a key greenhouse gas, and the roles that ocean and land ecosystems play in absorbing carbon dioxide;
- The Glory mission, also scheduled for launch in 2008, will continue measurements of solar irradiance and provide new space-based measurements of aerosol properties that will help scientists better understand the spatial and temporal variability of aerosol properties and the extent to which aerosols produced by natural events or human activities affect climate variability and change;
- The National Polar Orbiting Operational Earth Satellite System (NPOESS) Preparatory Project, or NPP satellite, will continue some of the measurements begun by the Earth Observing System and will demonstrate new instruments for the Nation's future joint civilian and military weather satellite system. NPP is scheduled for launch in 2009; and
- The Aquarius mission, scheduled for launch in 2009, will be the first satellite dedicated to obtaining global measurements of sea surface salinity, a key factor linking global ocean circulation and climate change.

NASA also is working with partners to reduce the time span between observations and production of useful data products. NASA is working with NOAA and inter-agency forums to transition mature research capabilities to operational systems and to utilize fully those assets for research purposes. In particular, they have created the Joint Center for Satellite Data Assimilation and the Short-Term Regional Prediction Center to accelerate the use of research data in operational forecasting in global and local weather forecasting, respectively.

On April 28, 2006, two Earth-observation satellites—CloudSat, a joint effort of NASA, the Canadian Space Agency, and the United States Air Force, and the Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO) satellite, a joint project of NASA and France's Centre National d'Etudes Spatiale—launched from Vandenberg Air Force Base in California. The satellites joined the Afternoon, or "A-train," constellation, which measures gases, aerosols, clouds, temperature, relative humidity, and radiative fluxes (the amount of radiation passing through the atmosphere). By mid-summer, both satellites were producing valuable data. (Boeing/T. Baur)

Findings from a decadal survey conducted by the National Research Council's Ad-hoc Committee on Earth Science and Applications from Space will influence strongly the process by which NASA implements future space-based missions for Earth science. The committee's final report is scheduled for release at the end of 2006.

Sub-goal 3B: Understand the Sun and its effects on Earth and the solar system.

Cost of Performance (in millions)
$974.71
Responsible Mission Directorate
Science

Life on Earth is closely linked to the Sun. Changes in the Sun's average energy output have been shown to cause dramatic climate changes over the centuries as solar activity went through a series of high and low cycles. During increased solar activity (i.e., an increase in sunspots), the Sun emits powerful flares that can disrupt telecommunications and navigation, threaten the health of astronauts in space, damage satellites, and disable electric power grids.

Scientists are just beginning to understand the physics of the Sun and its connection to Earth and the solar system. Increasing this understanding will enable scientists to predict the impact of solar variability on humans and space hardware. To achieve this goal, NASA is enhancing scientific understanding of the characteristics of solar wind, Earth's magnetosphere, and the space environment throughout the solar system, the heliosphere (the bubble in space around the Sun created by the solar wind), and planetary environments as a single, connected system. NASA also has begun to characterize the internal dynamics of the Sun and how Earth's magnetosphere responds to solar activity. Now NASA's challenge is to use this new knowledge to enable prediction of solar events and the space weather they produce.

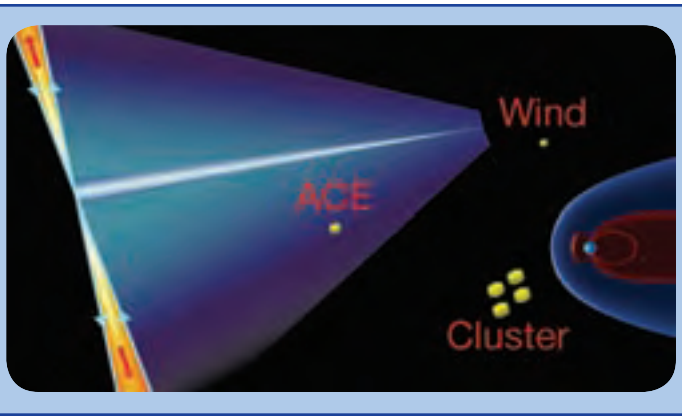
Reaping Benefits

Society is becoming increasingly dependent on technologies that are vulnerable to solar activity and space weather events, like wireless communications and satellite-based navigation, so the need to predict solar events and mitigate their effect is critical to the public's safety, security, convenience, and comfort. This prediction capability is critical to both human and robotic space exploration, as well, since space weather events can disrupt communications and spacecraft navigation and expose astronauts to unsafe levels of radiation. A better understanding of solar events and heliophysics will provide researchers the information needed to develop systems that will protect astronauts, satellites, and technologies in space and on Earth from harmful space radiation.

In addition to helping with space weather prediction and mitigation, NASA's heliophysics research provides insights into how the solar system evolved, how it produced and sustains life, and what will happen to this unique environment over time.

Highlighting Achievements

The backbone of NASA's heliophysics research is the multi-satellite Heliospheric Great Observatory, which includes all of NASA's currently operational heliophysics spacecraft. In FY 2006, the Heliospheric Great Observatory, including U.S. instruments on the European Space Agency's four Cluster spacecraft, observed an immense jet of electrically charged solar wind particles between the Sun and Earth. The jet was powered by clashing magnetic fields in a process called "magnetic reconnection." Similar reconnection-powered jets occur in Earth's magnetosphere, producing an effect that can disable orbiting spacecraft and disrupt power grids. However, the recently



NASA's Advanced Composition Explorer (ACE) and Wind spacecrafts, along with the European Space Agency's Cluster spacecrafts, encountered solar particle jets spanning 1.5 million miles. The jets (indicated by red arrows) are sandwiched between sheets of opposite magnetic fields (blue arrows). Earth's magnetic environment is visible to the right. The blue bubble in this magnetic environment represents a cross-section of the bow shock formed as solar wind hits Earth's magnetic field. The red area is a cross section of the magnetic field surrounding Earth (the small blue sphere). (NASA/M. Davis, Univ. of California at Berkeley)

discovered interplanetary jets are far larger than those that occur within Earth's magnetosphere. This observation is the first direct measurement indicating that magnetic reconnection can happen on immense scales.

Understanding magnetic reconnection is fundamental to understanding explosive phenomena like solar flares and gamma ray bursts throughout the universe and even nuclear fusion experiments conducted in laboratories. These observations also are proving important for planning the future four-spacecraft Magnetospheric Multiscale mission, which will study the fundamental physical process of magnetic reconnection.

The Great Observatory also discovered that rising tides of hot air from intense thunderstorm activity over South America, Africa, and Southeast Asia are connected to changes in the structure of Earth's ionosphere, according to NASA-funded researchers in a paper published in the August 11, 2006, issue of *Geophysical Research Letters*. The ionosphere is a layer of electrically charged plasma formed by solar X-rays and ultraviolet light. Storm-induced changes to the ionosphere influence the structure of the atmosphere and can disrupt radio signals from communication and navigation satellites.

Using data from NASA's Imager for Magnetopause-to-Aurora Global Exploration (IMAGE) spacecraft, the research team found four mysterious bright regions of plasma that were 20 to 30 percent more dense than the average bands of plasma encircling Earth above the equator. Three of the bright regions were located over tropical rainforests with plenty of storm activity. Computer simulations confirmed that the storms in these tropical areas produce rising tides of hot air, but the simulations could not explain the connection between the storms and the bright areas in the two bands. Thunderstorms develop in Earth's dense lower atmosphere just 10 miles over the equator. However, the plasma bands develop 500 miles above Earth in the ionosphere where the gas is about 100 million times less dense. The tide of hot air needs to collide with atoms in the ionosphere to create the bright areas, but because the gas in the ionosphere is so thin, atoms rarely collide.

In FY 2006, additional research showed that the tides could affect the plasma bands indirectly. Below the plasma bands, a layer of the ionosphere called the E-layer becomes partially electrified during the day. This E-layer shapes the plasma bands above by creating an electric field when the charged particles in the E-layer are blown across Earth's magnetic field. The research model showed that the rising tides of hot air from tropical storms around the world dump their energy in the E-layer, disrupting the plasma there. This in turn disrupts the electric fields and creates dense, bright zones in the bands above.

This is the first time that scientists have identified a regional influence on multiple layers of the atmosphere and related space weather. They now know that accurate predictions of ionospheric space weather disturbances must incorporate the effect of tropical weather.

In May 2006, NASA added five new Virtual Observatories to its Heliophysics Data Environment, a project to create a standardized, electronic tool to collect, store, manage, and distribute Sun–Earth physics mission data. The Virtual Observatories concept is part of an international effort to make accessible to the world's science community the vast, dynamic body of available astronomy and astrophysics data.

Confronting Challenges

All spacecraft that currently constitute NASA's Heliospheric Great Observatory are operating in extended service, past their planned ends-of-missions. However, the Heliophysics Division made good progress in FY 2006 toward refreshing the Observatory. NASA's partner for the Time History of Events and Macroscale Interactions (THEMIS) mission delivered, integrated, and tested the instruments for THEMIS's five spacecraft, and the mission is on schedule to launch late in 2006. NASA also tested and prepared the Aeronomy of Ice in Mesosphere (AIM) and Solar Terrestrial Relations Observatory (STEREO) missions for launch in FY 2007. Both missions were delayed in FY 2006 due to technical problems with their launch vehicles. NASA is working with the launch providers to prevent further delays. In addition, the Japanese Aerospace Exploration Agency (JAXA) launched the joint JAXA–NASA Solar–B mission, now renamed Hinode (the Japanese word for "sunrise"), on September 22, 2006. Through high-resolution observations, Solar–B will help researchers study the mechanisms that power the solar atmosphere and drive solar eruptions.

Moving Forward

In the years ahead, NASA will reconfigure portions of the Heliospheric Great Observatory into "smart" constellations, sets of strategically located satellites that will distribute data through Virtual Observatories.

STEREO is the next mission scheduled to launch in the Solar Terrestrial Probes Program, which manages missions that study the basic physics of how the Sun, its heliosphere, and planetary environments are connected in one system. STEREO will use two identical spacecraft to provide stereoscopic measurements of the Sun and coronal mass ejections, powerful solar eruptions that are a major source of magnetic disruptions on Earth and a key component of space weather.

Scheduled to launch in early 2007, THEMIS will study the onset of magnetic substorms within the tail of Earth's magnetosphere. THEMIS is composed of five microsatellite probes that will travel through different regions of the magnetosphere to provide information about substorm instability, a fundamental process of transporting charged particles from the magnetosphere into Earth's upper atmosphere.

AIM, a mission scheduled for launch in early 2007, will look at Earth's highest-altitude clouds. By characterizing the regions in which these clouds form, AIM will test the hypothesis that increased sightings of these clouds are related to changes in the concentrations of trace gases in the atmosphere and associated temperatures.

NASA will launch the second of the Two Wide-angle Imaging Neutral Atom Spectrometers, or TWINS–B, in 2007. NASA launched TWINS–A in early FY 2006. Together, the two TWINS spacecraft will provide stereo imaging of Earth's magnetosphere enabling three-dimensional global visualization of the connections between different regions of the magnetosphere and solar wind.

Launched almost 30 years ago to study Jupiter and Saturn, the Voyager spacecraft are journeying slowly out of the solar system. Scientists expect that in FY 2007, Voyager 2 will cross the termination shock, a boundary where solar winds slow to subsonic speeds at the edge of the Sun's influence. Early observations of this boundary by Voyager 2 indicate a large distortion in the shape of the heliosphere. Voyager 2 will supplement the data collected from Voyager 1 when it crossed the termination shock boundary in 2005, providing scientists with new information about local processes and the global structure and dynamics of the heliosphere.

In July 2006, technicians at Astrotech Space Operations, a commercial provider of satellite launch processing services in Florida, performed black-light inspection and cleaning of Observatory B, part of the twin-spacecraft STEREO mission. Later, the technicians wrapped the observatory for transfer to the hazardous processing facility, where it was weighed and fueled. At the Kennedy Space Center, crews stacked the Delta II rocket designated to launch STEREO in FY 2007. (NASA/G. Shelton)

Sub-goal 3C: 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.

Cost of Performance (in millions)
$1,948.93
Responsible Mission Directorate
Science

NASA uses robotic science missions to investigate alien and extreme environments throughout the solar system. These missions help scientists understand how the planets of the solar system formed, what triggered the evolutionary paths that formed rocky terrestrial planets, gas giants, and small, icy bodies, and how Earth originated, evolved, and spawned life. The data from these missions guide scientists in the search for life and its precursors beyond Earth and provide information to help NASA plan future human missions into the solar system.

Reaping Benefits

NASA's robotic exploration missions have taken humans to the edge of the solar system, revealing the beauty and complexity of its planets, moons, comets, and asteroids. These missions extend knowledge and understanding about Earth's neighborhood, the evolution of planetary systems, and the solar system's future. They also offer clues to the processes and events that created habitable zones in the solar system and beyond.

Robotic exploration lays the groundwork for future human missions to the Moon, Mars, and other bodies in the solar system by characterizing the environment of these distant worlds, validating new capabilities, and identifying potential landing sites. Robotic missions help NASA scientists explore the space environment to identify potential hazards, so that future human exploration missions can avoid the hazards or find ways to ameliorate the effects. In addition to hazards, robotic missions search for resources that could support long-duration human exploration. For example, the Mars Exploration Rovers and the current suite of Mars-orbiting missions are providing detailed information about the topography and mineral composition of the Martian surface and searching for signs of liquid water to identify landing sites that could provide human explorers with resources that would allow them to "live off the land."

Highlighting Achievements

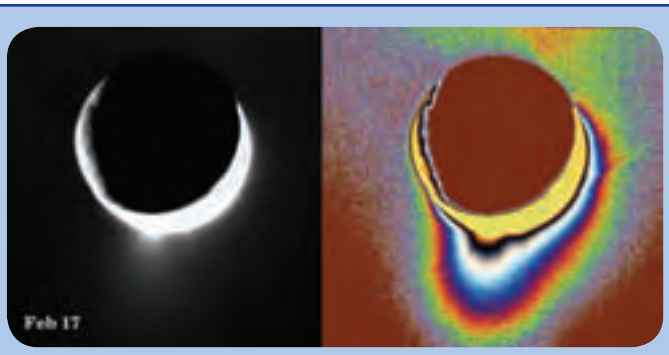
Launched in 2005, the Mars Reconnaissance Orbiter (MRO) entered Mars orbit in March 2006 and began its six-month campaign of aerobraking, a process by which the spacecraft repeatedly dips into Mars' atmosphere until it achieves the desired orbit. Using aerobraking instead of thruster firings reduces the amount of fuel required for the mission, making the vehicle lighter for launch. MRO achieved the desired orbit in early September 2006 and it will begin its two-year science phase in November 2006.

During its five-year mission, MRO will perform two important tasks: search for water and conduct reconnaissance for future robotic and human Mars missions. During MRO's science phase, it will return more data about the Red Planet than all previous Mars missions combined, helping researchers decipher the processes of change and prepare for human missions to Mars. It will study geological formations revealing the history of water on Mars, and it will search for minerals indicating whether water still sits below the surface. MRO will conduct close-up surveys, using the largest cameras ever flown on a planetary mission, to look for hot springs and other small water features and to identify obstacles like large rocks that could jeopardize the safety of future landers

Team members for MRO's High Resolution Imaging Science Experiment gather at the University of Arizona campus in Tucson to view the first Mars images (visible on the computer screen and projection screen in this photo) taken on March 24, 2006. (NASA/JPL/University of Arizona)

and rovers. MRO also will provide a high-data-rate communications relay that will support future missions to the surface of Mars.

The Cassini spacecraft, which has been in orbit around Saturn since July 2004, may have found liquid water reservoirs that erupt in Yellowstone-like geysers on Saturn's moon, Enceladus. This rare occurrence of liquid water so near the surface raises new questions about this mysterious moon. If the plume does contain liquid water, Enceladus may provide an environment suitable for living organisms. Other moons in the solar system, like Jupiter's moon Europa, have liquid water oceans covered by miles of icy crust. Enceladus, however, appears to have pockets of liquid water just yards below the surface.



Plumes of icy material extend above Enceladus's southern polar region in this image taken by Cassini on February 17, 2006. The color-coded version on the right reveals a fainter and much more extended plume component separated from the main plume by about 60 miles. (NASA/JPL/Space Science Institute)

Study of the plumes also suggest that Enceladus has active volcanism, where molten rock from the core pushes its way to the surface and releases lava, ash, and gas that alter the surrounding environment. Previously, researchers only knew of two places in the solar system where volcanism currently occurs, Earth and Jupiter's moon, Io. Volcanism also may occur on Neptune's moon, Triton.

In spring 2008, researchers will get another chance to look at Enceladus when Cassini flies within 220 miles of the moon.

Confronting Challenges

NASA's Planetary Science Division had a successful fiscal year, with operational missions working well and returning exciting scientific data. Several missions in implementation incurred problems. Due to cost and technical problems, NASA stopped the Dawn mission, then restarted it once a revamped implementation schedule and plan was developed and approved. This delayed the Dawn's launch date, but did not impact key science requirements. Due to funding shortfalls caused by Agency reprioritizations, NASA re-baselined the Juno mission. The new plan will delay launch, but will not impact key science requirements.

Moving Forward

New Horizons, launched in January 2006, is on its multi-year journey to Pluto, Charon, and the small rocky bodies that make up the Kuiper Belt. After an encounter with Jupiter in early 2007, when the spacecraft will gain a gravity assist from the massive planet, New Horizons will cruise for approximately eight years and arrive at Pluto in 2015. Once there, New Horizons will study the small, icy objects that inhabit this distant part of the solar system, revealing new information about their formation and the source and composition of comets.

The MESSENGER spacecraft, which NASA launched in August 2004, will fly by Venus in October 2006 and again in June 2007 as the spacecraft makes its way to the solar system's innermost planet, Mercury. The flybys will provide a gravity assist, after which MESSENGER will use the pull of Venus' gravity to alter and correct its path to Mercury, saving precious fuel. MESSENGER will perform its first flyby of Mercury in January 2008, and it will gradually work its way into orbit by March 2011. The spacecraft will take a close look at Mercury's surface, crust, atmosphere, and magnetic field to learn more about Earth's mysterious, rocky neighbor.

In 2006, NASA began to build and test the Phoenix Mars Lander. Scheduled for launch in 2007, Phoenix will land on Mars' icy northern pole to study the history of water and assess the potential for life at the ice–soil boundary. The spacecraft will take samples with a robotic arm and analyze the samples using its on-board "portable laboratory."

Throughout 2006, the Dawn mission underwent review, and engineers began preparing the spacecraft for launch in summer 2007. Dawn will study two large asteroids, 1 Ceres and 4 Vesta, to help scientists learn more about the conditions and processes that formed the solar system.

Also in 2006, NASA initiated the implementation phase of the Mars Science Laboratory (MSL) mission. MSL is the next flagship mission to conduct exploration of the solar system. This challenging mission, planned for launch in 2009, is a rover the size of a compact car. It boasts a suite of 10 scientific instruments that will conduct definitive mineralogy, search for organic compounds, study Mars's meteorology, and explore the potential past and present habitability of Mars. The largest lander since Viking in the 1970s, MSL's technologies will pave the way for future missions to planetary surfaces and directly benefit eventual human exploration of Mars.

Sub-goal 3D: Discover the origin, structure, evolution, and destiny of the universe, and search for Earth-like planets.

Cost of Performance (in millions)
$1,910.95
Responsible Mission Directorate
Science

NASA's Astrophysics Division seeks to answer fundamental questions about the larger environment in which humans live: How did the universe begin? Will the universe have an end? How are galaxies, stars, and planets created and how do they evolve? Are humans alone in the universe?

Using ground-based telescopes and space missions, NASA enables research to understand the structure, content, and evolution of the universe. This research provides information about humankind's origins and the fundamental physics that govern the behavior of matter, energy, space, and time. NASA-supported researchers look far into the universe, towards the beginning of time, to see galaxies forming. They also search for Earth-like planets around distant stars, determine if life could exist elsewhere in the galaxy, and investigate the processes that formed Earth's solar system.

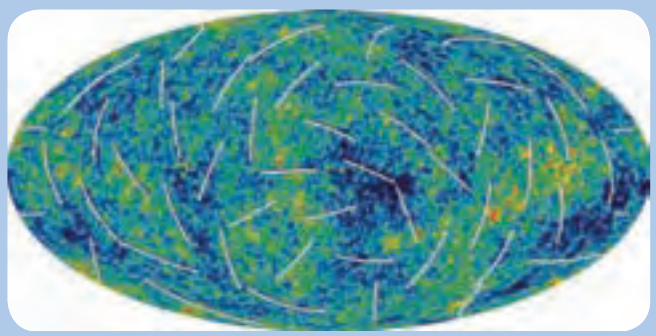
Reaping Benefits

The study of the universe benefits the Nation's scientific research community and industrial base by focusing research and advanced technology development on optics, sensors, guidance systems, and power and propulsion systems. Some of these technologies find their way into the commercial and defense sectors.

Research into the origins and nature of the universe contributes to "the expansion of human knowledge . . . of phenomena in the atmosphere and space," a charter objective in the 1958 Space Act. NASA's astrophysics missions—particularly the three Great Observatories, the Hubble Space Telescope, the Spitzer Space Telescope, and the Chandra X-ray Observatory—have provided researchers with new ways of looking at the universe so that they can expand knowledge about cosmic origins and fundamental physics. The interesting and beautiful images from these observatories also are educational tools to help spark student interest in science, technology, engineering, and mathematics.

Highlighting Achievements

New results based on three years of continuous observations from the Wilkinson Microwave Anisotropy Probe (WMAP) provided the most detailed temperature map to date of the early universe. The map discerns temperature differences of less than one-millionth of a degree, yielding the first full-sky map of the polarization of the cosmic microwave background, the afterglow light from the first moments after the Big Bang. Using this information, the WMAP science team announced two major results: additional evidence that cosmic inflation drove the early expansion of the universe and an improved estimate of when stars first "turned on."

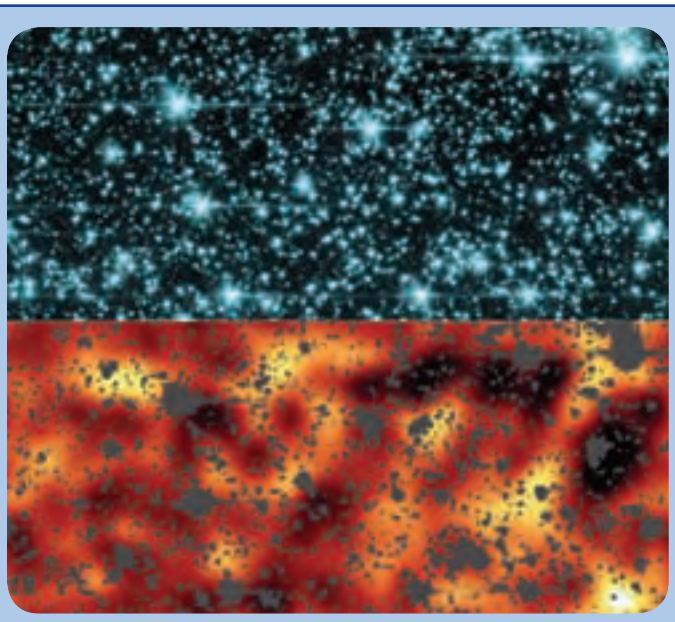


This map, created using data from WMAP, helps to pinpoint when the first stars formed and provides new clues about events that transpired in the first trillionth of a second of the universe. Colors indicate "warmer" (red) and "cooler" (blue) spots. The white bars show the "polarization" direction of the oldest light. (NASA/WMAP Science Team)

In November 2005, scientists using NASA's Spitzer Space Telescope announced that they detected light in the Draco constellation that may be from the earliest objects in the universe. This light could be from the very first stars or from hot gas falling into the first black holes. The science team described the observation as comparable to the glow of a distant city at night from an airplane—bright, but too distant and feeble to resolve individual objects. If confirmed, the observation will provide a glimpse of an era more than 13 billion years ago when, after the fading embers of the Big Bang gave way to millions of years of pervasive darkness, the universe came alive. The Spitzer

discovery supports observations made in the 1990s by NASA's Cosmic Background Explorer (COBE) suggesting there may be an infrared background that scientists could not attribute to known stars. It also supports observations made in 2003 by WMAP estimating that stars first ignited 200 million to 400 million years after the Big Bang.

Using an armada of telescopes, an international team of astronomers, funded in part by NASA, found the smallest planet ever detected outside the solar system. The extrasolar planet is five times as massive as Earth and orbits every 10 years around a red dwarf, a relatively cool star. The distance between the planet and its host is about three times greater than that between Earth and the Sun. The planet's large orbit and its dim parent star make its likely surface temperature a frigid minus 364 degrees Fahrenheit, a temperature similar to that of Pluto even though the planet is about 10 times closer to its star than Pluto is to the Sun.



The top panel is an infrared image from Spitzer of stars and galaxies in the Draco constellation. The bottom panel is the result after all the forefront stars, galaxies, and artifacts have been masked out. The background has been enhanced to reveal a glow that cannot be attributed to more recent galaxies or stars. This could be the glow of the first stars in the universe. (NASA/GSFC/JPL–Caltech)

The new planet, which scientists think is an icy, giant version of terrestrial planets like Earth and Mars, orbits the most common type of star in the Milky Way Galaxy, a red dwarf 20,000 light-years away in the Scorpius constellation. The discovery indicates that Earth-mass planets are not uncommon. The finding also supports theories of how Earth's solar system was formed, which proposes that planets were created from material accreting around a star.

Confronting Challenges

The Science Mission Directorate's Astrophysics Division is facing a budgetary challenge stemming from the many big missions it has undertaken. The biggest, most complex of these missions is the James Webb Space Telescope (JWST), identified by the National Research Council as a top-priority new initiative for astronomy and astrophysics in the current decade. NASA initially underestimated the life-cycle cost for JWST because of the difficulties predicting costs associated with developing a cutting-edge mission before completing the first major design review. In FY 2007, NASA and Agency partners will verify that all JWST new technologies have reached sufficient maturity to permit a realistic estimate of what the mission will cost.

Both the schedule and budget for the Space Interferometry Mission (SIM) exceeded NASA's initial estimates. To fit the mission within the Astrophysics Program's resources, NASA will scale back the pace of the SIM project and consider how this activity fits within the NASA planet finding and characterization program.

Since 1996, NASA and the German aerospace agency DLR have been developing the Stratospheric Observatory for Infrared Astronomy (SOFIA) mission, an astronomical observatory permanently installed in a modified Boeing 747 aircraft. Because of cost growth from technical and schedule problems, NASA held off on committing final funding to the project in its FY 2007 budget submission to Congress. In June 2006, NASA's Program Management Council determined that the program faces no insurmountable technical or programmatic challenges and, on July 6, NASA's Administrator gave the go-ahead to complete development. However, the Agency will conduct additional reviews to examine the proposed management and operations scenarios for this observatory and will base future development decisions on the project's successful achievement of cost and schedule milestones.

Moving Forward

SOFIA passed a major milestone in August 2006 when its Boeing 747 aircraft taxied down a runway in Texas under its own power. The SOFIA Aircraft Operations Team will conduct the first test flight in early 2007.

In FY 2006, the Stanford Linear Accelerator Center delivered to NASA the Gamma-ray Large Area Space Telescope's (GLAST's) primary instrument, the Large Area Telescope. The GLAST mission will improve scientists' understanding of the structure of the universe by analyzing the direction, energy, and arrival time of celestial high-energy gamma rays. GLAST will study the mechanisms of galaxies possessing a central core, or nuclei, that produces more radiation than the rest of the galaxy. It also will study dark matter, supernova remnants, pulsars, and rotating neutron stars, providing information crucial to solving the mysteries of high-energy gamma ray sources. NASA continues to prepare GLAST for launch in Fall 2007.

NASA's Astrophysics Division also has other observatory missions—including JWST, the Wide field Infrared Survey Explorer (WISE), and the Kepler mission—in formulation or development for launch near the end of the decade or early in the next decade. Managers for the Beyond Einstein Program have deferred selecting the program's next mission until a program-level review is completed. To aid with mission selection, program engineers will assess technology readiness for several mission options, including the Joint Dark Energy Mission (JDEM, a joint activity of NASA and the Department of Energy), Constellation–X (Con–X), the Laser Interferometer Space Antenna (LISA), Cosmic Microwave Background Polarization Probe (CMBPol), and the Black Hole Finder Probe (BHFP). The Beyond Einstein Program develops missions that study the physics of phenomena, like black holes, dark energy, and the Big Bang, predicted by several of Albert Einstein's theories.

Sub-goal 3E: Advance knowledge in the fundamental disciplines of aeronautics, and develop technologies for safer aircraft and higher capacity airspace systems.

Cost of Performance (in millions)
$1,050.00
Responsible Mission Directorate
Aeronautics Research

NASA's Aeronautics Research Mission Directorate conducts high-quality, innovative research to expand the boundaries of aeronautical knowledge for the benefit of the broad aeronautics community, which includes the Agency's partners in academia, industry, and other government agencies.

Reaping Benefits

NASA's aeronautics research leads to the development of revolutionary concepts, technologies, and capabilities that enable revolutionary change to both the airspace system and the aircraft that fly within it, facilitating a safer, more environmentally friendly, and more efficient air transportation system.

NASA's aeronautics research also supports the Agency's space exploration Strategic Goals. The Aeronautics Research Mission Directorate conducts research in key aeronautics disciplines such as aerodynamics, aerothermodynamics, materials, structures, and flight controls to advance the Nation's capabilities for safe flight through any atmosphere at any speed, be it our own, or that of another planet.

Highlighting Achievements

During FY 2006, NASA initiated a comprehensive restructuring of the Aeronautics Research Mission Directorate to ensure that it pursues long-term, cutting-edge research that expands the boundaries of aeronautical knowledge for the benefit of the broad aeronautics community, including the Agency's partners in academia, industry and other government agencies. Three core principles guided the restructuring:

1. Dedicate NASA aeronautics initiatives to the mastery and intellectual stewardship of the core competencies of aeronautics for the Nation in all flight regimes;
2. Focus research in areas that are appropriate to NASA's unique capabilities; and
3. Address the fundamental research needs of the Next Generation Air Transportation System (NGATS) while working closely with Agency partners in the Joint Planning and Development Office (JPDO).

Given these three principles, NASA then established the four programs within the Aeronautics Research Mission Directorate: the Fundamental Aeronautics Program; the Aviation Safety Program; the Airspace Systems Program; and the Aeronautics Test Program. The Fundamental Aeronautics Program conducts cutting-edge research that produces concepts, tools, and technologies that enable the design of vehicles that fly through any atmosphere at any speed. The Aviation Safety Program is focused on developing revolutionary tools, methods, and technologies that will improve the inherent safety attributes of current and future aircraft that will be operating in the evolving National Airspace System. The Airspace Systems Program directly addresses the fundamental air traffic management research needs of the NGATS. This research will yield revolutionary concepts, capabilities, and technologies that will enable significant increases in the capacity, efficiency and flexibility of the National Airspace System. The Aeronautics Test Program is ensuring the strategic availability and accessibility of a critical suite of aeronautics test facilities necessary to meet aeronautics, Agency, and national needs.

The Aeronautics Research Mission Directorate established a four-step approach to putting together technical plans in the ten aeronautics projects in our four aeronautics programs. The approach was designed to enable us to foster close collaboration with and to facilitate the exchange of ideas and information among researchers at NASA, industry, academia, and other government agencies, in a manner that benefits the community broadly. The four steps were:

1. NASA researchers, with input from other government agency partners, developed preliminary 10-year roadmaps for each program including technical milestones for each project.

2. NASA released a Request for Information to solicit interest from industry for non-reimbursable cooperative partnerships in pre-competitive research that would allow NASA to leverage industry's systems-level expertise while facilitating the rapid transfer of knowledge and technology from NASA to industry.
3. Using the preliminary roadmaps as a starting point, NASA researchers incorporated feedback from respondents to the Request for Information, as well as from colleagues in other government agencies, to develop refined technical proposals for each project. Panels of government subject-matter experts then reviewed and evaluated the proposals based on their technical, management, resource, and partnership plans. This rigorous proposal review process ensured that NASA has technically credible and relevant research objectives and a sound approach for pursuing these objectives. It also allowed NASA to identify research areas where it needed to supplement in-house capabilities with external expertise.
4. Finally, NASA released a NASA Research Announcement to solicit proposals, in a full and open competition, from the external community in those research areas. The Aeronautics Research Mission Directorate intends to have awards in place by November 2006.

While NASA spent much of the fiscal year planning and reorganizing the Agency's aeronautics research activities, several programs continued to make notable achievements. Within the Airspace Systems Program, the Future Air Traffic Management Concepts Evaluation Tool (FACET) won NASA's Software of the Year award for 2006. FACET is a flexible software tool that rapidly models up to 15,000 aircraft trajectories, using Federal Aviation Administration air traffic data and weather data from the National Weather Service, on a desktop computer to help plan traffic flows at the national level. The Aeronautics Test Program initiated test technology investments, including standardizing wind tunnel measurement systems across all the Centers and developing test facility control system simulators. The Aviation Safety Program completed the Airborne Subscale Transport Aircraft Research (AirSTAR) test bed. It will support research in the prevention and recovery of upsets in transport aircraft. Finally, the Fundamental Aeronautics Program completed the Mach 5 testing of the Ground Demonstration Engine–2 in the NASA 8-Foot High Temperature Tunnel. NASA teamed with the Air Force Research Laboratory and Pratt & Whitney Rocketdyne to complete the tests. The NASA tests marked the first time a closed-loop, hydrocarbon-fueled, fuel-cooled scramjet was tested at hypersonic conditions. Fuel cooling of the scramjet is essential for the hardware to survive the extreme temperatures of hypersonic flight.

The Ground Demonstration Engine–2 (GDE–2) undergoes tests at the NASA Langley Research Center 8-Foot High Temperature Tunnel. Mach 5 air is compressed in the inlet, without the aid of rotating parts, and ignited with the addition of a hydrocarbon fuel to produce thrust at hypersonic speeds. (NASA)

Confronting Challenges

In FY 2006, the Aeronautics Research Mission Directorate worked toward aligning its research with current Agency needs. NASA leadership closed-out discontinued projects, reassigned staff, and identified new projects. The Aeronautics Research Mission Directorate now is positioned to begin work on these challenging new projects.

Moving Forward

Fundamental Aeronautics Program (projects to be achieved in 2007 to 2008)

- The Subsonic Fixed Wing project will develop and test component technology concepts used in conventional aircraft configurations to establish the feasibility of achieving significant noise reduction (Stage 3—42 EPNdb cum). For unconventional aircraft configurations, project engineers will develop and test component technology that establishes the feasibility of achieving short take-offs and landings on runways less than 3,000 feet.

- The Subsonic Rotary Wing project will validate model engine stall-control concepts using component test data obtained in the Glenn Research Center's CE18 Facility in order to improve the operability range of rotorcraft (helicopter) engines.
- The Supersonics project will use laboratory tests to validate a composite containment system for supersonic engine fan blades that is 20-percent lighter than the metallic containment system developed by the High Speed Research Program in the late 1990s (which now serves as a technology baseline). This will demonstrate advancement in new concepts for high efficiency propulsion and airframes for supersonic aircraft. The project also will validate a high-fidelity analysis technique for assessing the impact of nozzle plume effects on the off-body flow field of a supersonic aircraft, aiding in the development of predictive noise-propagation modeling.
- The Hypersonics Project will investigate an advanced Mars entry shape by sub-orbital flight testing of the Sub-orbital Aerodynamic Re-entry Experiments (SOAREX). The flight data, coupled with ground-based experimental data, will provide a baseline for the validation of computational tools to predict flight characteristics and the life of the ablator heat shield materials under extreme heating. In a separate activity, NASA's arc-jet facilities will be used to characterize the behavior of advanced heat shield systems to provide a database for material degradation models for hypersonic vehicles.

Aviation Safety Program (projects to be achieved in 2007)

- Researchers will assess aircraft aging and durability research capabilities at NASA and other agencies to establish a baseline for the project.
- The Integrated Intelligent Flight Deck project will develop a Phenomena Identification and Ranking Table that baselines the project's state-of-the-art hazard knowledge and identifies future flight deck research needs in sensor technologies.
- The Integrated Vehicle Health Management project will install flight research measurement equipment and perform flight-readiness checks of ice crystal measuring systems for follow-on flight research campaigns. In 2008, the project will conduct in-flight tests in high ice–water content conditions to increase the accuracy of measured total water content by 50 percent over the existing instrumentation.
- The Integrated Resilient Aircraft Controls project will assess a dynamic tool that is to be operated in the AirSTAR flight research testbed. Additionally, project members will define upset condition capability requirements in aerodynamics, propulsion, and structures and identify potential technology barriers.

Airspace Systems Program

- In FY 2007 through FY 2008, the Airspace Systems Program researchers will pursue advanced formulation and development activities through laboratory analysis, as well as human-in-the-loop experiments with air and ground operators, to evaluate automated strategic and tactical separation assurance under conditions with increasing air-space complexity. Elements of complexity will include extensive diversity in aircraft size and type, initial time-based metering technologies, refined communication, navigation, and surveillance capabilities, failure recovery operations, increased uncertainty, and two- to three- times nominal traffic levels.

Aeronautics Test Program

- NASA and the Department of Defense will begin an aeronautics facility testing alliance, the National Partnership for Aeronautics Testing, to develop cost and access policies to aid interagency cooperation and use in the management of their respective assets.
- The Aeronautics Test Program will initiate activities that will improve facility operational efficiencies. Activities of interest include exploring the centralization of NASA strain gauge balance (instrumentation that measures forces in wind tunnels) activities which include balance technology development, design, manufacture, and calibration.

Sub-goal 3F: Understand the effects of the space environment on human performance, and test new technologies and countermeasures for long-duration human space exploration.

Cost of Performance (in millions)
$367.07
Responsible Mission Directorates
Exploration Systems Space Operations

When astronauts return to the Moon and journey to further destinations, they will be exposed to the microgravity, radiation, and the isolation of space for long periods of time. Keeping crews physically and mentally healthy during such long-duration missions will require new technologies and capabilities. NASA is studying how the space environment, close quarters, heavy workloads, and long periods of time away from home contribute to physical and psychological stresses and is developing technologies that can prevent or mitigate the effects of these stresses. NASA also is looking for innovative ways to meet the basic needs of astronauts—oxygen, water, food, and shelter—with systems that can operate dependably for weeks on the Moon and, eventually, for months on Mars.

Reaping Benefits

The medical knowledge and diagnostic and treatment technologies NASA uses to keep humans healthy and productive in space improve the medical treatment and health of humans on Earth. For example, NASA's research into human adaptation to microgravity has helped scientists better understand the changes that come with aging, such as bone loss, muscle atrophy, and loss of balance. NASA-developed telemedicine technologies, which helps doctors on Earth monitor and treat astronauts in space through a combination of computer-assisted imaging and diagnostics, video, and telecommunications, also help doctors deliver quality medical care to people in isolated or underserved areas of the world. These technologies allow doctors located thousands of miles apart to collaborate in real time on medical treatment.

Companies have taken NASA life-support and medical technologies and developed them into commercial products that serve the public. Light-emitting diodes originally designed to grow plants in experiments aboard the Space Shuttle are now used to treat brain tumors. Devices built to measure the astronauts' equilibrium when they return from space are widely used by major medical centers to diagnose and treat patients with head injuries, stroke, chronic dizziness, and central nervous system disorders. A company turned a small, portable device originally designed to warn Shuttle and International Space Station (ISS) crewmembers of depressurization into a hand-held device that warns pilots, mountain climbers, skydivers, and scuba divers of hazardous conditions before depressurization and hypoxia become a health threat. For more information on NASA technology-transfer successes, please visit the Spinoff home page at *http://www.sti.nasa.gov/tto/*.

Highlighting Achievements

In FY 2006, the Exploration Systems Mission Directorate began implementing a number of recommendations presented in the Exploration Systems Architecture Study completed in 2005. The Exploration Systems Mission

In Spring 2006, engineers from NASA's Marshall Space Flight Center helped improve the lives of villagers in Kendala, Iraq, using technologies and capabilities developed for the Environmental Control and Life Support System used on the International Space Station. A non-profit group, Concern for Kids, donated to Kendala a water filtration and purification pump system designed by Water Security Corporation using Space Certified Technology developed for NASA. When the system first arrived in Kendala, the iodine bed that helps purify the water had dried out. Engineers at Marshall emailed advice and instructions that helped the team in Kendala fix the system. The villagers now have safe, clean drinking water. (NASA)

Directorate refocused biomedical research and human life support activities through a new set of milestones and requirements that target timely delivery of research products and reorganized its management structure to support NASA's exploration goals. As part of this effort, Exploration Systems created two new programs, the Human Research Program and the Exploration Technology Development Program. During this refocusing, Human Research and Exploration Technology researchers continued work on many projects, continuing the Exploration Systems Mission Directorate's progress toward achieving Sub-goal 3F.

To mitigate the highest risks to astronaut health and performance, the Human Research Program conducts research and develops technologies to enable safe, reliable, and productive human space exploration. In FY 2006, the program initiated an exhaustive programmatic review of its focus areas—bone and muscle research, cardiology, pharmacology, neurological sciences, nutrition, immunology, behavioral health, and performance disciplines—to assess the program's research, data, and knowledge completed to date and its significance to current exploration missions and determine what work still needs to be done to implement the Vision for Space Exploration.

The Human Research Program also restructured and refocused its ISS utilization approach under the ISS Medical project to better coordinate ISS research and maximize use of facilities aboard the ISS and other space-based research platforms. One of the first flight experiments conducted under this new project is the Stability of Pharmacotherapeutic and Nutritional Compounds experiment, delivered to the ISS by STS-121 in July 2006. The Stability experiment documents how the radiation environment in space affects vitamins and compounds in foods and medication. The results will help researchers select, or develop if necessary, foods and medications that will remain stable and reliable during long-duration human exploration missions to the Moon and Mars.

Scientists at Johnson Space Center analyze the Stability samples returned on STS-121. Knowing how the space radiation environment affects foodstuffs and pharmaceuticals will help NASA better plan for exploration missions. (NASA)

The Exploration Technology Development Program develops technologies—structures, thermal protection systems, non-toxic propulsion, life support systems, capabilities for in-situ resource utilization, and many others—for future human and robotic exploration missions. In FY 2006, the program focused on maturing technologies for the Orion Crew Exploration Vehicle through a combination of ground- and ISS-based research. Within the program, the Exploration Life Support project made progress in developing new concepts and technologies for removing carbon dioxide and humidity from spacecraft environments. These technologies are lighter and smaller than those currently used on the ISS, freeing up valuable mass on future exploration vehicles. The Advanced Environmental Monitoring and Controls project prepared monitoring technologies for flight deployment and testing aboard the ISS: the Vehicle Cabin Air Monitor, which monitors gases in the air, the Electronic-Nose, which detects air "events," and a first-generation bacterial monitoring system.

In August 2006, ISS crew successfully completed the Dust and Aerosol Measurement Feasibility Test (DAFT), an experiment to characterize the distribution and size of dust particles floating in the air aboard the ISS. DAFT tested the effectiveness of fire safety technology in detecting greater-than-normal amounts of particles in the air, a difficult task in a near-weightless environment where air circulates differently and heavier particles are not pulled toward the ground. The technology validated by DAFT will fly as part of the Smoke Aerosol Measurement Experiment (SAME) in 2007.

The NASA science officers for ISS Expeditions 12 and 13 conducted the Capillary Flow Experiment (CFE) to determine how capillary forces—the interaction of liquid with solid that can draw a fluid up a narrow tube—act in a near-weightless environment. NASA can use capillary forces to control fluid orientation and transport to enable predictable performance for mission-critical systems such as propellant storage and water purification.

CFE first flew during Expedition 9 in 2004, and experiment results have provided new data that engineers can apply to current and advanced system designs.

Confronting Challenges

NASA's greatest challenge for Sub-goal 3F is limited access to the ISS and reduced ISS crew size following the *Columbia* accident. With the reestablishment of regular Space Shuttle flights and the restoration of the ISS crew complement to three, ISS science productivity should increase.

In June 2006, NASA conducted "walk back" tests at the Johnson Space Center's mock-up facility to determine if a crewmember could walk 10 kilometers (a little over six miles) from a failed lunar rover back to home base. In this photo, a technician inside NASA's Mark III Advanced Space Suit is attached to a rig that simulates low gravity. While he walked, equipment monitored his heart rate, temperature, and carbon dioxide output to evaluate how hard he worked to go 10 kilometers. The results of the walk back tests will be used to improve space suit designs. (NASA)

Moving Forward

The Exploration Systems Mission Directorate is on track to develop critical technologies in time for the Orion Crew Exploration Vehicle preliminary design review in 2008. To support this ambitious goal, NASA will fly a number of experiments on the ISS, including SAME and the Boiling Experiment Facility, which will study boiling mechanisms critical to the proper design of heat removal equipment for spacecraft. The Glenn Research Center is conducting final flight hardware testing on the Combustion Integrated Rack and the Fluids Integrated Rack that will form the Fluids and Combustion Facility, an ISS facility that will accommodate the research needs of fluid physics and combustion science. The Combustion Integrated Rack, currently scheduled for launch in summer 2008, has a 100-liter combustion chamber surrounded by optical and other diagnostic packages. The Fluids Integrated Rack, scheduled for launch in early 2009, features a large, user-configurable space for conducting experiments, advanced imaging capabilities, laser and white light sources, and other capabilities. Once completed, the Fluids and Combustion Facility will support experiments in fundamental fluids physics and combustion science to help NASA develop life support technologies and propulsion systems.

In June 2006, the European Space Agency delivered its ISS module, the Columbus research module, to the Kennedy Space Center. NASA engineers are processing the module for launch on the Space Shuttle in 2007. Columbus will expand ISS research facilities and provide researchers with the ability to conduct numerous experiments in the life, physical, and materials sciences. NASA plans to move the Human Research Facility racks from the U.S. Destiny Laboratory (added to the ISS in 2001 and 2005) to Columbus to combine them with the European Space Agency's physiology racks, maximizing flight research capabilities for the Human Research Program.

In addition to its planned work on the ISS, the Human Research Program will characterize the structure and toxicity of lunar dust. Using samples of dust vacuumed from Apollo space suits, scientists will analyze dust particle size, morphology, and mineralogy to develop a simulated lunar dust that NASA can distribute in larger quantities for research and testing. The program will start toxicity testing in 2008. Scientists will use test results to establish crew exposure limits and to help them design environmental control and life support systems for lunar surface vehicles and suits for extravehicular activities.

Strategic Goal 4: Bring a new Crew Exploration Vehicle into service as soon as possible after Shuttle retirement.

Cost of Performance (in millions)
$1,622.16
Responsible Mission Directorate
Exploration Systems

The Nation's current space transportation systems—NASA's Space Shuttle and commercially available expendable launch vehicles—are unsuitable for human exploration beyond low Earth orbit. Therefore, the President and Congress directed NASA to develop new space transportation capabilities to return humans to the Moon and eventually carry them to Mars. NASA initiated the Constellation Systems Program to achieve this objective. So far, the program includes the Orion Crew Exploration Vehicle (CEV), Ares I, an expendable crew launch vehicle, Ares V, a heavy-lift cargo launch vehicle, spacesuits and tools required by the flight crews, and associated ground and mission operations infrastructure to support initial low Earth orbit missions.

Orion will be America's new spacecraft for human space exploration. It will carry four crewmembers to the Moon and serve as the primary exploration vehicle for future missions. It also will be capable of ferrying up to six astronauts (plus additional cargo) to and from the International Space Station (ISS) if commercial transport services are unavailable. The Ares I will consist of a solid rocket booster and an upper stage that can carry Orion into low Earth orbit.

Reaping Benefits

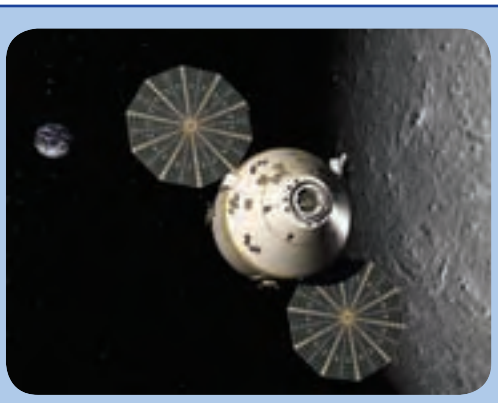
Orion will support the expansion of human exploration missions and provide the means to take humans to the Moon and eventually Mars, where they can conduct scientific activities and make discoveries not possible solely with robotic explorers.

As with past and current human exploration programs, NASA's efforts to develop Orion and the Ares launchers will accelerate the development of technologies that are important for the economy and national security. The advanced systems and capabilities required for space travel include power generation and storage, communications and navigation, networking, robotics, and improved materials, all of which could be used on Earth to meet commercial and other national needs. As Shuttle activities begin to wind down, Shuttle personnel will find new, challenging positions working on Constellation Systems development efforts, keeping this highly skilled segment of America's workforce productive and competitive. Constellation Systems also will provide a training ground for the next generation of scientists and engineers who will realize the Nation's space exploration dreams.

Furthermore, Orion will serve as a public symbol of the Nation's continued commitment to space exploration, much as the Shuttle has over the past 25 years. NASA anticipates that the exploration initiatives will spark the public's imagination and inspire the Nation's youth to pursue careers in science, technology, engineering, and mathematics as a result of their renewed interest in space.

Highlighting Achievements

During FY 2006, NASA continued preliminary design work and began systems testing, including heat shield tests at the Ames Research Center arc-jet facility. Johnson Space Center engineers built a full-scale mock-up of the command module, which will be used to test systems in situ. NASA established an intra-agency CEV Smart Buyer Team to perform trade studies and design analysis to help the CEV Project Office understand and verify the appropriateness of the requirements incorporated into the CEV Phase II solicitation.



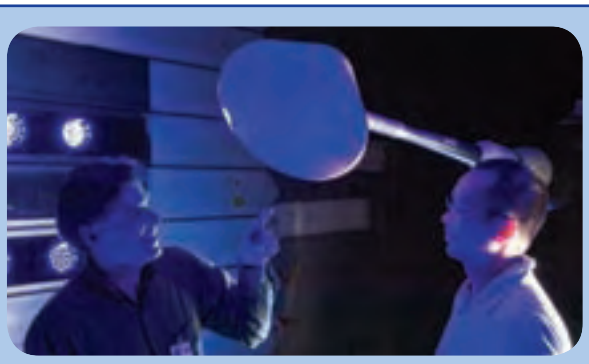
On August 31, 2006, NASA announced that it would award to Lockheed Martin the contract to build the Orion Crew Exploration Vehicle, shown here in an artist's rendering. Since July 2005, NASA worked with two teams, Lockheed Martin and Northrop Grumman/Boeing, to do preliminary trade studies, requirements, and design concepts in preparation for the August 2006 selection. (Lockheed Martin)

On August 31, after careful consideration of the submitted proposals, NASA awarded to Lockheed Martin the contract to develop Orion—the first in over 30 years calling for the development of a new manned space vehicle. Lockheed Martin will work with NASA to deliver the Orion vehicle by 2014.

NASA subjected a partial model of Ares I, including part of the upper stage, the spacecraft adapter, Orion, and the launch abort system, to over 80 runs of wind tunnel tests at the Ames Research Center. Data collected during these tests help engineers understand the aerodynamic characteristics of the vehicle, giving the designers insight into the algorithms necessary for flight control software to control the vehicle during ascent. NASA also successfully completed preliminary tests of an augmented spark igniter, a critical engine component that ignites a mixture of liquid hydrogen and liquid oxygen propellants while in-flight.

Throughout the fiscal year, NASA took small, but important steps toward achieving Strategic Goal 4:

- In May, NASA selected the RS-68 engine to power the core stage of the heavy-lift cargo launch vehicle, Ares V, superseding NASA's initial decision to use a derivative of the Shuttle main engine. Studies examining life-cycle cost showed the RS-68, which is the most powerful liquid oxygen/liquid hydrogen booster in existence, to be the best choice. The RS-68 currently is used in the Delta IV launcher, the largest of the Delta rocket family.
- NASA assigned development tasks to each of the Centers:
  - Ames Research Center is developing the thermal protection systems and information technology systems for the spacecraft;
  - Dryden Flight Research Center leads the abort flight test integration and operations;
  - Glenn Research Center manages the work on Orion's service module and the development of the Ares I upper stage;
  - Goddard Space Flight Center is responsible for communications, tracking, and support mechanisms;
  - Jet Propulsion Laboratory leads planning for systems engineering processes related to operations development and preparation;
  - Johnson Space Center manages Constellation Systems and the astronaut corps and leads development for the crew module;
  - Kennedy Space Center is developing the ground systems for Constellation Systems and will process and launch Orion and Ares;
  - Langley Research Center leads the Launch Abort System integration;
  - Marshall Space Flight Center manages all launch vehicle projects and launch vehicle testing; and
  - Stennis Space Center tests the rocket propulsion systems.



In March 2006, NASA engineers (from left) Paul Espinosa and Tuan Truong, study a scale model of the CEV under blue light to prepare the model for testing in the Ames Research Center's Unitary Wind Tunnel Complex. This test demonstrated the aerodynamic properties of the heat shield design (the model is painted with special, pressure-sensitive pink paint used in the testing). Additional tests conducted in the Ames arc-jet facility, which resembles a room-size blowtorch, tested potential materials for the heat shield. (NASA)

In addition to the Orion development, Strategic Goal 4 includes development of a next-generation spacesuit capable of supporting exploration. Engineers at Johnson Space Center are testing spacesuit configurations under various scenarios, like an emergency "walk back" during which a crewmember would walk from a stalled rover to a lunar lander or habitat. In June, Johnson Space Center conducted a walk back simulation where a NASA engineer walked more than six miles on a treadmill wearing the Mark III Advanced Space Suit Technology Demonstrator (see photo in Sub-goal 3F). Rigging connected to the spacesuit helped simulate different gravity levels, including

Engineers at Marshall Space Flight Center conduct a hot-fire test of a scaled-down model of main injector hardware in July 2006. This device will inject and mix liquid hydrogen and liquid oxygen propellants in the main combustion chamber of the upper-stage rocket engine that will be used in the Ares I Crew Launch Vehicle and the Ares V Cargo Launch Vehicle. The hot-fire tests are part of efforts to investigate design options for, and maximize performance of, the J-2X upper stage engine, an updated version of the powerful J-2 engine used to launch the Saturn V rocket upper stages during Apollo. The injector was fired horizontally with varying fuel temperatures and different propellant mixtures for 10 to 20 seconds at a thrust of approximately 20,000 pounds. Data collected during these tests will help engineers investigate design options for, and maximize performance of the J-2X upper stage engine. (NASA)

lunar gravity. The goal was to determine if an astronaut could do a strenuous walk in the spacesuit and still be able mentally and physically to work the hatch on the lander or habitat. The results provided useful guidance for spacesuit modifications.

Confronting Challenges

Achieving Strategic Goal 4 will require careful management to keep the Constellation Systems Program within budget and on schedule.

Another factor affecting achievement of Strategic Goal 4 is performance under Strategic Goals 1 and 2. The Space Shuttle represents the biggest commitment in NASA's budget. NASA must retire the Shuttle as soon as possible, while also meeting the commitment to complete the ISS, to free up budget for Constellation Systems.

In preparation for the transition from Shuttle to Orion, NASA is studying options for transitioning workforce, facilities, and assets from the Space Shuttle Program to Constellation Systems. If the transition is delayed, NASA could face increased costs and the loss of skilled workers. Therefore, NASA is conducting trade studies and analyses to understand more clearly the technical requirements for projects, space systems, and vehicle development and testing to ensure that Orion and Ares I are operational no later than 2014.

Moving Forward

Now that NASA Centers have their assigned tasks, work on Orion, Ares I, and supporting systems can begin in earnest. In FY 2007, NASA will conduct a System Design Review for all elements of Constellation Systems. A successful review will allow the program to begin preliminary design work on additional projects. A Preliminary Design Review of Orion, the Ares I, and the Exploration Communications and Navigation Systems project will also be completed. In FY 2007, NASA also will conduct a Preliminary Design Review for a spacesuit that can be worn during extravehicular activity.

Strategic Goal 5: Encourage the pursuit of appropriate partnerships with the emerging commercial space sector.

Cost of Performance (in millions)
$44.00
Responsible Mission Directorates
Exploration Systems

NASA pursues collaborations that help expand the commercial space sector and support NASA's Mission. Of particular interest to NASA is the expansion of launch service providers. As the Space Shuttle nears retirement, NASA is interested in obtaining International Space Station (ISS) cargo delivery and return services provided by emerging companies. By helping them to expand their services and increase their experience, NASA hopes to encourage the growth of a competitive market that will help to reduce launch costs and provide NASA with access to new capabilities. NASA hopes to stimulate the emerging U.S. entrepreneurial launch sector and accelerate the growth of the commercial space industry by awarding prizes and intellectual property rights for achievements in creating space technologies and systems.

NASA also is encouraging the emerging U.S. commercial space sector through more creative, less traditional approaches. In 2006, NASA selected two emerging aerospace companies, Space Exploration Technologies and Rocketplane–Kistler to demonstrate ISS cargo transportation services. Should they successfully demonstrate their cargo transportation capabilities, they will be able to bid to provide cargo transportation services for the ISS after Shuttle retirement. Since FY 2005, NASA has held prize competitions, called Centennial Challenges, for ground-based demonstrations of breakthroughs in various aerospace technologies. Although there is no guarantee that a breakthrough or winner will emerge from any particular prize competition, by encouraging participation, NASA hopes to encourage private sector breakthroughs across a broad range of technologies and designs.

Reaping Benefits

Since NASA's creation in 1958, the commercial sector has been the Agency's partner in space exploration. NASA purchases launch vehicles for robotic missions from the commercial sector. NASA works with commercial partners to develop communication and navigation systems, build spacecraft, and design spacesuits. Along the way, the commercial space sector has grown into a multi-billion-dollar industry that delivers services, such as satellite television and global navigation, to the public and contributes to a strong U.S. economy. Historically, several large corporations have driven the commercial space industry, but now start-up ventures are pushing the sector into new areas. With the 2004 award of the first Ansari X–Prize—to Mojave Aerospace Ventures for flying its sub-orbital vehicle to more than 62 miles altitude twice in two weeks—and other ongoing private space efforts, the potential for the commercial space sector to engage new markets is stronger than ever. In return for supporting both established and emerging commercial ventures, NASA gains access to a wider range of technologies and services at more competitive prices.

Highlighting Achievements

The emerging commercial space sector continued to grow in FY 2006 with the successful launch in July of Bigelow Aerospace's Genesis I inflatable Earth-orbit module, a proof-of-concept mission to show the feasibility of using inflatable structures to serve as modules for future space stations and habitats. Inflatables are attractive for space exploration because they offer large volume, but are easier to launch than rigid structures because they weigh far less and pack up smaller. Bigelow will evolve the Genesis technology into a larger, more capable Nautilus inflatable structure.

The technology used for Genesis I originated in the 1990s at the Johnson Space Center as part of NASA's TransHab project to create an inflatable module for the ISS. Although NASA discontinued the TransHab project, technology development continued when NASA and Bigelow signed an exclusive licensing agreement transferring the technology to Bigelow. A second license gave Bigelow access to NASA's radiation shielding technology. Bigelow and NASA continue to collaborate to evolve inflatable technology.

The multi-day Genesis I mission yielded a second benefit for NASA because the inflatable carried the NASA Genebox, a prototype microlaboratory that may fly on small-scale satellites (called nanosats) in the near future. The ability to perform research in such small-scale laboratories could mean more experiments launching for less money and in less time than costly larger counterparts. Although this flight of the NASA Genebox focused on testing the microlab's systems and NASA's procedures for working with the hardware, a later version of the Genebox will track and analyze DNA changes in living things while in space.

The Exploration Systems Mission Directorate established the Commercial Crew and Cargo Program Office at Johnson Space Center and assigned the office responsibility for managing NASA's Commercial Orbital Transportation Services Projects. The program office released a final Commercial Orbital Transportation Services demonstration announcement to solicit proposals for the initial commercial ISS transportation demonstration phase. On August 18, 2006, NASA entered into agreements with Space Exploration Technologies and Rocketplane–Kistler to demonstrate the vehicles, systems, and operations needed to re-supply, return cargo from, and transport crew to and from the ISS.

Bigelow Aerospace used inflatable technology developed for NASA's TransHab module, shown here (top photo) during testing at Johnson Space Center, as the basis for the company's Genesis project. Genesis I, shown here (bottom) in a photo taken by a camera mounted to the inflatable as it successfully orbited Earth in August 2006, is a one-third-scale model meant to shake-out problems. Bigelow will fly a follow-up mission, Genesis II, in early 2007. (top: NASA; bottom: Bigelow Aerospace)

Confronting Challenges

One of NASA's challenges is to expand the Agency's base of launch services providers to include emerging U.S. companies. The current requirements for launching NASA payloads are designed to protect NASA's investment in Agency missions. NASA payloads are often one-of-a-kind and of high value, so it is imperative that all reasonable measures be taken to assure launch success. The NASA Launch Services Program is exploring ways to open the bidding process to a larger number of launch providers, lowering launch prices and helping emerging launch providers gain experience to compete more successfully, while protecting NASA's—and the country's—investment in valuable mission assets. The Commercial Orbital Transportation Services projects are a new approach to providing launch services for the ISS. But before NASA will purchase these services, the companies will have to demonstrate the required capabilities.

Moving Forward

In FY 2007, the Innovative Partnerships Program, the Mission Support Office that manages NASA's partnership, technology transfer, and space product development efforts, will concentrate on integrating its business areas so that they better complement and leverage each other. Program management also will develop additional performance metrics (see Part 2 for the program's FY 2006 performance metrics) and build civil servant core competencies.

The Exploration Systems Mission Directorate currently is working with commercial partners to demonstrate cargo delivery and return capabilities to support ISS cargo re-supply once the Shuttle retires. Partner demonstrations are on track to be able to provide operational cargo services to the ISS beginning in 2010. Additionally, NASA's commercial partners have agreed to the budgets and schedules that will allow bringing an optional crew transportation capability on-line after initial successful cargo demonstrations. The Space Operations Mission Directorate, which acquires commercially available expendable launch vehicles for the Agency's mission needs, plans to purchase crew and cargo launch services for the ISS from U.S. commercial launch providers when they become available.

NASA wants to obtain these services as soon as possible so that Shuttle flights can focus on delivering large construction elements and facilities to the ISS. The commercial flights would augment launch services currently provided by the Russian Space Agency's Soyuz and uncrewed Progress vehicles, enabling the partners to increase the number of crewmembers aboard the International Space Station. The Space Operations Mission Directorate also will continue advanced planning to support NASA's evolving launch requirements for lunar exploration.

A team demonstrates their concept for a robotic climber, which could climb a ribbon, powered only by the beam from an industrial searchlight during the 2005 Beam Power Challenge, held in October. Although none of the 11 teams won the challenge, the University of Saskatchewan Space Design Team had the farthest climb, approximately 40 feet. Participants will meet again in October 2006 to compete for the Beam Power Challenge prize offered by NASA's Centennial Challenges Program. (NASA/ K. Davidian)

In FY 2007, NASA and Agency partners will conduct several Centennial Challenges competitions:

- The Beam Power Challenge, to improve the efficiencies and power densities of wireless power transmission;
- The Lunar Lander Challenge, to develop the necessary technologies for reusable transport between low lunar orbit and the lunar surface;
- The Tether Challenge, to stimulate the development of new high-strength, low-weight materials;
- The Astronaut Glove Challenge, to make pressurized gloves less fatiguing and more dexterous for the astronauts' hands;
- The Regolith Excavation Challenge, promoting development of new technologies to excavate lunar soil (also known as regolith); and
- The Personal Air Vehicle Challenge, encouraging technology developments that increase safety, usability, and capacity of general aviation aircraft.

The on-going Moon Regolith Oxygen (MoonROx) Challenge, to develop technologies for technology demonstration of high extraction rates of breathable oxygen from simulated lunar soil, is open throughout all of FY 2007 and expires in June 2008.

NASA has restructured the Centennial Challenges to ensure that some of these competitions will be conducted on an annual basis, through the year 2011.

Strategic Goal 6: Establish a lunar return program having the maximum possible utility for later missions to Mars and other destinations.

Cost of Performance (in millions)
$665.26
Responsible Mission Directorates
Exploration Systems Science Space Operations

NASA's Vision for the future is clear. America's robotic and human explorers will venture farther into the solar system than ever before. The first stop on this exciting voyage will be the Moon, where robots, then humans, will explore the lunar surface in depth to supplement the work done by their Apollo predecessors. Early robotic missions will survey and characterize potential landing sites, as well as mining sites from which astronauts later can process lunar resources. Longer-duration lunar missions will enable astronauts to test new technologies for communications, computing, navigation, power generation, propulsion, habitation systems, and in-space construction and servicing processes. NASA and the Agency's partners are developing these technologies today to support achieving the Vision for Space Exploration tomorrow.

Reaping Benefits

NASA and the Agency's partners transfer advanced space exploration systems and capabilities—power generation, communications, computing, robotics, and improved materials from space exploration research and execution—to the commercial sector to serve public, national, and global needs. In the past, technologies developed for space exploration have yielded ground-based applications such as non-polluting solar energy systems, advanced batteries for laptop computers and cell phones, and fuel cells for electric vehicles.

Historically, space exploration has inspired industry, academia, and individual researchers to redefine what is "possible." NASA's Vision to expand the limits of robotic and human exploration through a technically ambitious portfolio of programs should provide even greater challenges and opportunities for personal development and future economic growth to NASA's extended family of visionary partners.

The activities under Strategic Goal 6 lay the groundwork for NASA's future human space exploration goals. Through the successful completion of these activities, NASA will have the technologies and capabilities to support humans on the Moon by the time the Orion Crew Exploration Vehicle and the Ares launch vehicles are fully operational. Along the way, these activities will benefit other efforts across NASA: new power generation and nuclear technologies will help future space exploration missions; autonomous systems and integrated systems health management can make air travel safer and more efficient; and improved space communications enable better data delivery to and from the Space Shuttle, the International Space Station, and robotic spacecraft.

Highlighting Achievements

In 2006, the Exploration Systems Mission Directorate initiated development of a multinational exploration strategy. Working with the worldwide community of space agencies, academia, and private sector stakeholders, the Exploration Systems Mission Directorate defined six primary lunar exploration themes that provide the high-level rationale for lunar exploration and a detailed set of over one hundred lunar exploration objectives. The Exploration Systems Mission Directorate and the Office of External Relations are engaged in discussions with 13 international space agencies to understand each agency's unique interests related to lunar exploration and to determine where NASA's interests overlap. The Exploration Systems Mission Directorate also is engaged in discussions with the private sector to understand the role that these organizations may play in future lunar exploration efforts.

During FY 2006, NASA established the Lunar Precursor and Robotic Program (previously called the Robotic Lunar Exploration Program) Office at Marshall Space Flight Center. The program will conduct a series of missions that support the overall lunar exploration effort, and may include missions that will investigate radiation protection and dust mitigation technologies.

In 2006, the Lunar Reconnaissance Orbiter (LRO) mission passed the Preliminary Design and Confirmation Reviews, where an external team reviewed plans for systems, software, and vehicle configuration and determined that the project should progress forward to the development stage. To take advantage of the launch vehicle's ability

to carry two spacecraft, NASA also selected a secondary lunar mission, the Lunar Crater Observation and Sensing Satellite (LCROSS), to launch with LRO.

NASA is conducting a multi-Center effort to develop robotic vehicles capable of crossing a wide variety of terrains. As part of this effort, the Jet Propulsion Laboratory developed the All-Terrain Hex-Legged Extra-Terrestrial Explorer (ATHLETE). As the name suggests, ATHLETE is tough and flexible, able to roll over smooth terrain similar to the Apollo landing sites or walk (the wheels freeze to serve as "feet") over extremely rough or steep terrain and sandy grades. On smooth terrain, ATHLETE can move more than a 100 times the speed of its Mars Exploration Rover cousins. ATHLETE can support robotic or human missions on the Moon by loading, transporting, manipulating, and depositing payloads almost anywhere. It can dock or mate with other devices, including refueling stations, excavation equipment, and other ATHLETE rovers to provide increased payload capacity. In FY 2006, the Jet Propulsion Laboratory demonstrated ATHLETE's capabilities in desert field tests and conducted autonomous tests, during which two ATHLETE rovers docked together.

Engineers at the Jet Propulsion Laboratory conduct a docking experiment with two ATHLETE rovers. The legs move independently and offer six degrees of freedom for greater manipulation and balance. The robot responds to voice and gestures, enabling suited astronauts to direct it easily. ATHLETE's shape allows it to fold up for compact stowage, and it can deploy itself at the destination. (NASA/JPL–Caltech)

Confronting Challenges

Currently, the major risk for the LRO mission is the schedule to meet the milestone to launch in 2008 set forth in the Vision for Space Exploration. Another schedule-related challenge is that LCROSS, as a design-to-cost mission, must stay on schedule to launch with LRO and to stay within its proposed cost.

Moving Forward

In November 2006, the Exploration Systems Mission Directorate plans to conduct the Critical Design Review for LRO, when NASA validates the LRO spacecraft design. If the design passes review, NASA's mission partners will begin fabricating the spacecraft. The mission currently is scheduled to launch in October 2008.

NASA will pursue other activities in support of Goal 6 starting in FY 2007:

- The Exploration Systems Mission Directorate is conducting a lunar architecture study to identify the systems needed for lunar surface exploration and to determine when the systems must be available to meet NASA's schedule. As part of this, the Exploration Systems Mission Directorate will determine the technology requirements for power, in-situ resource utilization, and autonomous systems.
- NASA engineers will demonstrate four processes for producing oxygen from lunar soil. This is an important step toward in-situ resource utilization, a necessary capability for long-duration lunar exploration.
- NASA will continue to test in a series of field campaigns advanced robotic systems working in collaboration with suited astronauts.
- NASA engineers will demonstrate advanced storage of cryogenic propellants to support long-duration orbiting of the Earth departure stage and the lunar lander.
- NASA engineers also will initiate non-nuclear, subscale tests of fission power conversion subsystems, as part of a larger effort to develop the fission surface power technology demonstration unit. The results of these activities would provide performance and cost data and reduce technical risk and cost uncertainties associated with the design and development of a nuclear flight power system.
- NASA researchers will begin a new project to investigate the effects of lunar dust on surface systems and humans. The researchers will use the results to develop techniques for minimizing dust accumulation.

Financial Overview

Financial Statements and Stewardship

NASA's financial statements, which appear in Part 3: Financials of this Performance and Accountability Report, are unaudited. The statements provide information regarding the financial position and results of the Agency's operations. Agency management is responsible for the integrity and objectivity of the financial information in these statements.

NASA prepared the financial statements and financial data presented throughout this Performance and Accountability Report from the Agency's financial management system and other Treasury reports in accordance with the requirements and formats prescribed by the Office of Management and Budget. The Agency's financial statements, notes, Required Supplementary Information, and Required Supplementary Stewardship Information are provided in Part 3: Financials of this Report.

Overview of Financial Position

The following table provides summary financial information for fiscal years 2006 and 2005. Significant changes in balances are discussed in the sections that follow.

(Dollars in Millions)

	Change 2006 Over 2005	Unaudited FY 2006	Unaudited FY 2005
Condensed Balance Sheet Data			
Fund Balance with Treasury	18%	$ 9,585	$ 8,146
Accounts Receivable	-6%	185	196
Inventory and Related Property, Net	-23%	2,330	3,019
Property, Plant, and Equipment	-5%	33,193	34,926
Other Assets	0%	17	17
Total Assets	**-2%**	**$ 45,310**	**$ 46,304**
Accounts Payable	-13%	$ 1,848	$ 2,132
Environmental and Disposal	8%	893	825
Other Liabilities	9%	572	526
Total Liabilities	**-5%**	**$ 3,313**	**$ 3,483**
Unexpended Appropriations	31%	$ 6,981	$ 5,318
Cumulative Results of Operations	-7%	35,016	37,503
Total Net Position	**-2%**	**$ 41,997**	**$ 42,821**
Total Liabilities and Net Position	**-2%**	**$ 45,310**	**$ 46,304**
Intragovernmental Net Costs	10%	$ 403	$ 367
Gross Costs with the Public	16%	17,268	14,927
Less: Earned Revenues from the Public	-67%	29	88
Total Net Cost of Operations	**17%**	**$ 17,642**	**$ 15,206**

Assets

NASA's Consolidated Balance Sheet shows that the Agency had total assets of $45.3 billion at the end of fiscal year 2006, compared with $46.3 billion in 2005. This represents a net decrease in assets of $994 million (2.1%). The decrease in net assets is a result of a decrease in the Agency's net General Property, Plant and Equipment (PP&E), due largely to the impact of current period depreciation.

NASA's Inventory and Related Property decreased by $689 million (22.8%) in FY 2006 as a result of a reclassification of certain reusable materials to PP&E. These items are in support of NASA's International Space Station, Shuttle and Hubble Space Telescope programs.

NASA's General PP&E, at $33.2 billion, represents 74% of the Agency's total assets as of September 30, 2006. This is a decrease of $1.7 billion (5%) from 2005 General PP&E balances. This decrease is primarily related to a

decrease in net Theme Assets. Current period Theme Assets increased by $1.5 billion in 2006, offset by an increase in accumulated deprecation for Theme Assets of $3.4 billion. This resulted in a decrease in the net (book value) of the Agency's Theme Assets by $1.9 billion (12%).

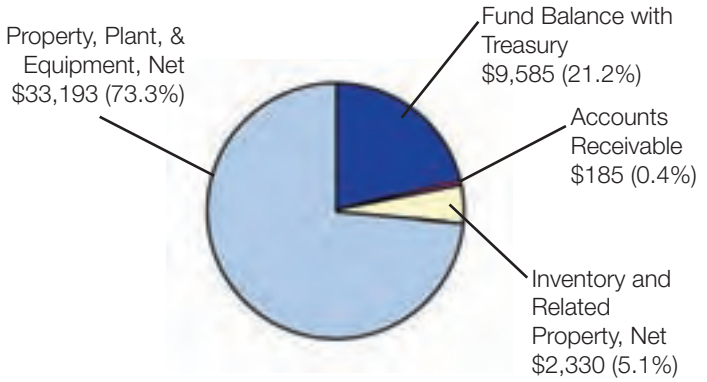
Theme Assets, at $14.5 billion, are the largest component of the Agency's General PP&E, representing 44% of General PP&E. Work-in-Process, at $13.2 billion, is the next largest component of total General PP&E (40%). Work-in-Process reflects the cost of equipment and facilities currently under construction. Total Work-in-Process decreased by $203 million (1.5%) in FY 2006.

NASA's contractors hold over 24% of the Agency's General PP&E. Difficulties substantiating the value of contractor-held General PP&E have contributed to a continuing material weakness identified by NASA's independent public auditors. NASA has developed improved internal controls for all types of PP&E. Those improvements will be implemented throughout 2007.

As one of those improvements, NASA is considering a change in its accounting policy for Theme Assets to reclassify some costs previously categorized as General Property, Plant & Equipment (PP&E) as Research and Development (R&D) expenses. In FY 2006, NASA drafted a policy to implement this change and requested that FASAB clarify the accounting standards the Agency used as the basis for the draft change. NASA anticipates a response from the Federal Accounting Standards Advisory Board (FASAB) in FY 2007.

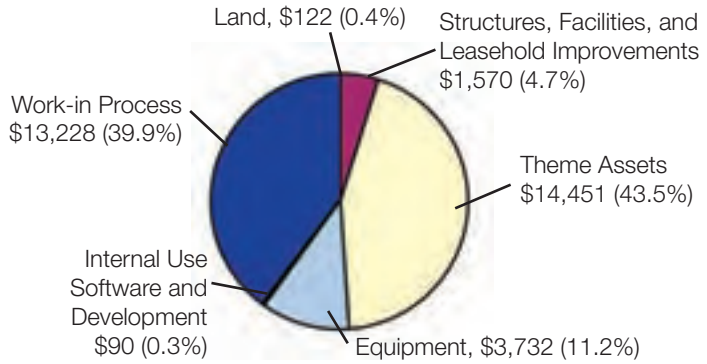
NASA's Fund Balance with Treasury (FBWT), at $9.6 billion, accounts for 21 % of the Agency's total assets. FBWT represents the Agency's "cash" account, and includes funds available for disbursement in support of NASA programs and projects.

Major Assets By Type (Dollars in Millions)
As of September 30, 2006



Total Assets $45,310 (amount includes other assets of $17 million)
Source: Consolidated Balance Sheet

General PP&E (Dollars in Millions)
As of September 30, 2006



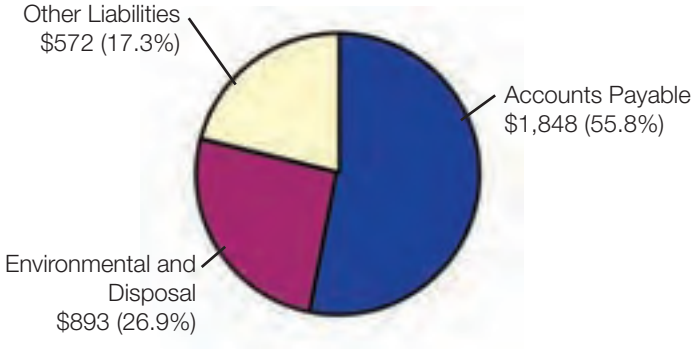
Total General PP&E $33,193
Source: Notes to FY 2006 Financial Statements, Note 7

Liabilities

The Agency had total liabilities of $3.3 billion as of September 30, 2006. This represents a decrease in total liabilities from fiscal year ends' 2006 to 2005 by $170 million. NASA's largest liability is its Accounts Payable. This balance is consistent with the accrued payables necessary to support NASA operations. NASA is compliant with all prompt payment regulations and is timely in its vendor payments, with only 0.001% of interest penalties paid on total non-credit card invoices. This compares favorably with the government standard of no more than 0.02%.

Environmental and Disposal liabilities represents estimated cleanup costs from NASA operations resulting from actual or anticipated contamination from waste disposal methods, leaks, spills, and other past activity that created a public health or environmental risk. This estimate could change in the future due to the identification of additional contamination, inflation, deflation, changes in technology or applicable laws and regulations. The estimate will also change through ordinary liquidation of these liabilities as the cleanup program continues into the future. The estimate represents the amount that NASA expects to spend in the future to remediate currently known contamination. NASA has implemented new procedures and tools to improve the accuracy and consistency of environmental cleanup estimates. Estimates increased this year from last year by 8%, from $825 million to $893 million.

Major Liabilities By Type (Dollars in Millions)
As of September 30, 2006



Total Liabilities $3,313
Source: Consolidated Balance Sheet

Ending Net Position

NASA's Net Position as of September 30, 2006, reported on the Consolidated Balance Sheet and the Consolidated Statement of Changes in Net Position, was $41.9 billion, a $824 million (1.9%) decrease from 2005. Net Position is the sum of Unexpended Appropriations and Cumulative Results of Operations.

NASA's Unexpended Appropriations increased by 31.3% in 2006, to $6.9 billion from $5.3 billion. The increase in Unexpended Appropriations is due principally to a delay in receiving this year's full apportionment that resulted in corresponding delays in incurring costs and disbursements.

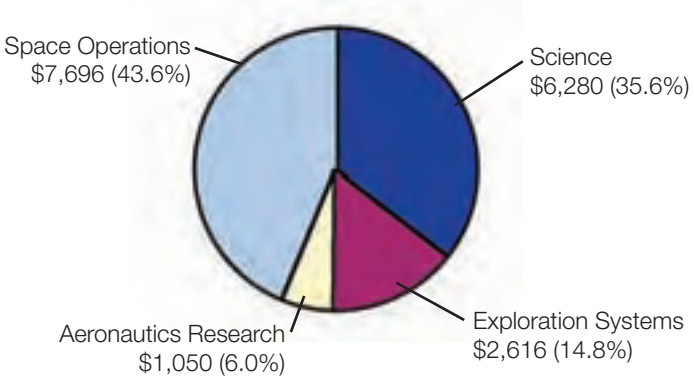
Results of Operations

NASA's total sources of funds available for 2006 operations were $20.1 billion. This compares with total sources of funds in FY 2005 of $20.2 billion, a decrease of 0.6%. Unobligated Balances, Brought Forward were $860 million (27.8%) less in 2006 than in 2005, reflecting the stabilization of Agency programs and projects related to the Vision for Space Exploration. NASA's Budgetary Authority increased by $408 million (2.3%) in 2006, to $17.7 billion.

The Consolidated Statement of Net Cost presents the Agency's gross and net costs by major business lines. The net cost of operations is the gross (total) cost incurred by the Agency, less any earned revenue from other government organizations or from the public. The Agency revised its accounting structure for 2006 to reflect the Agency's major business lines. This enhances the Agency's ability to track and assign costs by capturing them in the same structure used to manage the work, improving the ability to analyze and report on performance. Due to this change, it is not possible to generate a comparable Consolidated Statement of Net Cost for 2005.

The Agency's net cost of operations for 2006 was $17.6 billion. Space Operations (including NASA's

Uses of Funds (Dollars in Millions)
For the Fiscal Year Ended September 30, 2006



Total Uses of Funds $17,642
Source: Consolidated Statement of Net Cost

Shuttle and International Space Station programs), at $7.7 billion, and Science, at $6.3 billion, were the Agency's largest business lines in 2006.

Limitation of the Financial Statements

These financial statements have been prepared to report the financial position and results of operations for NASA pursuant to the requirements of Chapter 31 of the United States Code section 3515(b). While these statements have been prepared from the books and records of the Agency in accordance with U.S. generally accepted accounting principles (GAAP) for Federal entities and the formats prescribed by the Office of Management and Budget, these statements are, in addition to the financial reports, used to monitor and control the budgetary resources that are prepared from the same books and records. These statements should be read with the realization that they are for a component of the U.S. government, a sovereign entity.

Key Financial-Related Measures

Below is a table of key financial measures, as of September 30, 2006, consistent with the Chief Financial Officers (CFO) Council financial metrics.

Measure, Frequency, and Importance	NASA Sept. 2006	NASA Sept. 2005	Government-wide July 2006[1]	Government-wide Performance Standards		
				Fully Successful	Minimally Successful	Unsuccessful
Measure: Fund Balance With Treasury—Net Percentage Unreconciled **Frequency:** Monthly **Importance:** Smaller reconciliation differences indicate greater financial integrity	0.07%	0.7%	0.124%	< = 2%	> 2% to < = 10%	> 10%
Measure: Percentage of Amount in Suspense (Absolute) Greater than 60 Days Old **Frequency:** Quarterly **Importance:** Timely reconciliation supports clean audits and accurate financial information	58%	13.5%	60.9%	< = 10%	> 10% to < = 20%	> 20%
Measure: Percentage of Delinquent Accounts Receivable from Public Over 180 Days **Frequency:** Quarterly **Importance:** Actively collecting debt improves management accountability and reduces U.S. borrowing	8.75%	5.8%	13.63%	< = 10%	> 10% to < = 20%	> 20%
Measure: Percentage of Electronic Payments to Vendors **Frequency:** Monthly **Importance:** Electronic funds transfers reduces cost	99.4%	99.6%	95.61%	> = 96%	> = 90%	< 90%
Measure: Percentage of Non-Credit Card Invoices Paid on Time **Frequency:** Monthly **Importance:** Timely payment reduces interest charges	99.1%	95.0%	96.06%	> = 98%	< 98% to > = 97%	< 97%

Measure, Frequency, and Importance	NASA Sept. 2006	NASA Sept. 2005	Government-wide July 2006[1]	Government-wide Performance Standards		
				Fully Successful	Minimally Successful	Unsuccessful
Measure: Percentage of Interest Penalties Paid on Total Non-Credit Card Invoices **Frequency:** Monthly **Importance:** Smaller interest payments show that bills are paid on time and allows funds to be used for their intended purpose	0.001%	0.001%	0.014%	< = .02%	> .02% to < = .03%	> .03%
Measure: Travel Card Delinquency Rate—Individually Billed Accounts **Frequency:** Monthly **Importance:** Reducing outstanding travel card balances helps increase rebates to agencies	2.5%	2.5%	3.16%	< = 2%	> 2% to < = 4%	> 4%
Measure: Travel Card Delinquency Rate—Centrally Billed Account **Frequency:** Monthly **Importance:** Reducing outstanding travel card balances helps increase rebates to agencies	0.0%	0.0%	1.17%	0%	> 0% to < = 1.5%	> 1.5%
Measure: Purchase Card Delinquency Rate **Frequency:** Monthly **Importance:** Reducing outstanding purchase card balances helps increase rebates to agencies and reduces interest payments	0.0%	0.0%	0.98%	0%	> 0% to < = 1.5%	> 1.5%

[1]July 2006 data was the latest available for government-wide reporting from the Chief Financial Officer's Council's Metric Tracking System at publication of this report.

Overall, for FY 2006, the Agency's financial metrics improved due largely to the increased attention received from Agency and Center CFO offices and overall improvements to NASA's financial management internal controls including monthly reporting to the Agency CFO from each Center CFO.

Systems, Controls, & Legal Compliance

Overview

The *Federal Managers' Financial Integrity Act* (FMFIA) of 1982 requires federal agencies to establish "controls that reasonably ensure that (i) obligations and costs are in compliance with applicable law; (ii) funds, property, and other assets are safeguarded against loss, unauthorized use or misappropriation; and (iii) revenues and expenditures applicable to agency operations are properly recorded and accounted for to permit the preparation of accounts and reliable financial and statistical reports and to maintain accountability over the assets." In addition, the agency head annually must evaluate and report on the control and financial systems that protect the integrity of federal programs (Section 2 and Section 4 of FMFIA respectively).

Section 2 of FMFIA requires the head of each agency to submit a statement on whether there is reasonable assurance that the agency's controls are achieving their intended objectives and, as applicable, report on material weaknesses in the agency's controls. A separate statement on the effectiveness of internal controls over financial reporting is included as a subset of the overall assurance statement.

Section 4 of FMFIA requires a statement on whether the agency's financial management systems conform to government-wide requirements. In addition, the *Federal Financial Management Improvement Act* (FFMIA) of 1996 requires the agency head to evaluate and determine whether the financial management systems substantially comply with its requirements. The systems also must comply with any other applicable laws.

The Administrator's statement of assurance is based on information gathered from a variety of sources, including the Administrator's personal knowledge of NASA's day-to-day operations, existing controls, management program reviews, and other internal reports. If the Agency's systems do not comply with the FMFIA, the assurance statement must identify any material weaknesses and include NASA's corrective action plan to address those weaknesses.

This year, NASA began several initiatives to improve internal accounting and administrative control processes. As part of this effort, NASA's Office of the Chief Financial Officer established an Office of Quality Assurance to strengthen and improve both internal controls and NASA compliance with financial management policy, FMFIA, and requirements from the Office of Management and Budget (OMB). Personnel from the Office of Quality Assurance conducted on-site assessments to document and test key internal controls for compliance with FMFIA and OMB Circular A-123, Appendix A: *Internal Control over Financial Reporting*.

NASA further improved the Agency's internal accounting and administrative controls processes by taking the following actions: developing and distributing a new policy on internal controls; conducting training on the requirements and implementation of OMB Circular A-123, *Management's Responsibility for Internal Control*; assessing and testing financial statement line items and related processes; and analyzing 120 identified risks as supporting evidence for the Administrator's statement of assurance. The Officials-in-Charge of NASA Headquarters offices and the Agency's Center Directors identified these risks by submitting individual statements of assurance for their respective organizations to the NASA Administrator.

A NASA Headquarters team evaluated the 120 risks identified in the 28 statements of assurance and developed recommendations for consideration by the Operations Management Council, one of NASA's three governing bodies that provide senior-level oversight of NASA's operations. The Operations Management Council holds an annual meeting to confirm the deficiencies in Agency processes that will be reported as material weaknesses. This year, the Council recommended that two previously reported material weaknesses—Space Shuttle Return to Flight and Financial Management Data Integrity—be closed out; two previously reported material weaknesses—Asset Management and Financial Management System—continue to be reported as weaknesses; and Information Technology Security be raised from an internally tracked deficiency to an externally reported material weakness.

Management Assurances

November 15, 2006

NASA management is responsible for developing and maintaining effective internal controls and financial management systems that meet the objectives of the *Federal Managers Financial Integrity Act* (FMFIA). Based on the results of our FY 2006 assessment of the effectiveness and efficiency of operations, and compliance with applicable laws and regulations in accordance with OMB Circular A-123, *Management's Responsibility for Internal Control*, I am able to submit a qualified statement of assurance that NASA's internal controls and financial management systems meet the objectives of FMFIA. This assessment identified two material weaknesses, Asset Management and Information Technology Security, reported under Section 2 of FMFIA, and a third material weakness, Financial Management System, reported as a non-conformance under Section 4 of FMFIA. In FY 2006, NASA closed two previously reported material weaknesses: Space Shuttle Return to Flight and Financial Management Data Integrity. (A summary of the weaknesses and corrective action plans follow this statement.) Other than these exceptions, the Agency found no other material weaknesses in the design or operations of internal controls.

NASA also conducted an assessment focused on the effectiveness of internal control over financial reporting, which includes safeguarding of assets and compliance with applicable laws and regulations, in accordance with the requirements of Appendix A of OMB Circular A-123. NASA is taking a multi-year approach toward achieving compliance through the NASA Financial Management Internal Control (FMIC) Plan. This statement reflects the status of internal control over financial reporting for four significant line items as of June 30, 2006: Property, Plant, and Equipment; Fund Balance with Treasury; Material and Supplies; and Unfunded Environmental Liabilities. Based on the results of this evaluation, NASA identified one material weakness—Financial Management System—related to internal control over financial reporting. Other than this exception, the Agency found no additional material weaknesses in the design or operation of the internal controls over financial reporting. Due to the identified weakness and the scope of our assessment for FY 2006, NASA is only able to provide a qualified statement of assurance that the Agency's internal controls over financial reporting were operating effectively as of June 30, 2006.

In accordance with the *Federal Financial Management Improvement Act* (FFMIA), NASA management is responsible for implementing and maintaining financial management systems that substantially comply with federal systems requirements, applicable federal accounting standards, and the U.S. Government Standard General Ledger (SGL) at the transaction level. Due to several remaining corrective actions defined in the Agency's 2005 Corrective Action Plan, NASA's financial management systems are not substantially compliant with the requirements of the Act as of September 30, 2006.

As explained in the auditor's report in Part 3: Financials, NASA's independent auditors were unable to render an opinion on our FY 2006 financial statements and issued a disclaimer of opinion. Therefore, I cannot provide reasonable assurance that the financial data in this report are complete and reliable. As we face the many challenges ahead of us, we will focus on bringing NASA's financial management system into compliance.

Michael D. Griffin
Administrator

Corrective Action Plan

New Material Weakness

Information Technology (IT) Security

FMFIA Section 2 Weakness

Responsible Official: Chief Information Officer

Description: NASA's IT Security Program needs more effective implementation, monitoring, enforcement, verification, and validation. NASA's policy and procedures are not consistent with new OMB directives, and the Agency's systems are noncompliant with the *Federal Information Security Management Act of 2002*. This deficiency affects mission accomplishment by compromising the integrity, availability, and confidentiality of mission critical data. The operational efficiency of the Agency also is hampered by the inconsistent application of security solutions at different Centers. If this weakness goes unchecked, mission resources may have to be reallocated to bring the Agency's IT systems into compliance.

Corrective Action Plan: NASA has been improving IT security for the past three years through a corrective action plan that made changes to the Agency's IT security policies and requirements. In FY 2006, NASA updated and distributed a new NASA IT security policy, established standard operating procedures to meet Agency requirements, and updated NASA's IT security training and certification programs. Despite these changes, recent IT security incidents and Office of Inspector General audit results revealed that the same problems still exist. Therefore, in FY 2007, NASA will: establish independent methods for verifying and validating processes related to IT security; create an organizational structure that will assure consistency in the way that Centers implement new IT security processes; and, revise IT security clauses for use in NASA contracts.

Continuing Material Weaknesses

Asset Management

FMFIA Section 2 Weakness

Responsible Official: Chief Financial Officer

Description: NASA's lack of proper management controls has resulted in inconsistent financial recording practices contributing to misstated asset values and period expenses. Therefore, NASA needs to improve the Agency's management controls for the financial accounting and reporting of NASA owned Property, Plant, and Equipment; materials; space parts; and other assets. The Agency also needs to improve accounting for contractor-held property.

Corrective Action Plan: The Agency's strategy for addressing this material weakness is to align NASA's policies, processes, and systems with published accounting standards and appropriate accounting standards-setting organizations. As part of this strategy, NASA revised the Agency's asset capitalization policy (currently under review by the Federal Accounting Standards Advisory Board). NASA also used working groups to identify solutions and implementation plans for process and system gaps between current and desired business processes. In addition, the Agency implemented a new Procurement Information Circular to improve accounting for property furnished to contractors, including transfers, retirement, and recovery of government property.

Financial Management System

FMFIA Section 4 Weakness

Responsible Official: Chief Financial Officer

Description: In FY 2003, NASA implemented the Core Financial Module of the Integrated Enterprise Management System. The Core Financial Module replaced all disparate Center-level accounting systems, the NASA Headquarters accounting system, and approximately 120 ancillary systems. However, NASA management identified

significant errors in the data produced by Core Financial Module beginning in September 2003 as a result of problems in the conversion effort and system configuration. Limitations in Core Financial Module software still require the implementation of compensating controls and systems, further complicating the resolution of this weakness.

Corrective Action Plan: NASA continues to develop and implement procedures for identifying and validating the Agency's financial data and processes. In FY 2006, these efforts included aligning internal controls with authoritative guidance and implementing automated financial system functions to complement process changes. Specific progress toward improving this material weakness included:

- Developing and distributing a monthly schedule with due dates generated by a cross-Agency task team for data processing, reconciliations, verifications, feedback, and reports;
- Performing periodic controls reviews and reconciliations at all Centers for 23 specific activities, after which each Center developed a corrective action plan (monitored monthly by Headquarters) to assure the timely resolution of anomalies;
- Completing financial management internal control assessments and testing for four significant accounts (Fund Balance with Treasury; Property, Plant, and Equipment; Material and Supplies; and Environmental Liabilities) in accordance with the NASA Financial Management Internal Control Plan. In June 2006, NASA updated and submitted this plan to OMB;
- Reviewing, validating and redesigning NASA's financial statements to ensure accuracy of reporting and consistency with the requirement of OMB Circular A-136, *Financial Reporting Requirements*;
- Producing monthly financial statements directly from the Core Financial system within 30 days after the closing of each period. This process included documenting data anomalies or corrections and preparing of statement analyses; and
- Modifying the Agency's Statement of Net Cost to provide a breakdown of net costs by major lines of business, consistent with OMB Circular A-136.

Closed Items

Space Shuttle Return to Flight

FMFIA Section 2 Weakness

Responsible Official: Associate Administrator for Space Operations Mission Directorate

Description: The loss of the Space Shuttle *Columbia* in 2003 revealed a material weakness centered on loss of control and enforcement of NASA's standards of technical excellence, safety, teamwork, and integrity.

Corrective Action Plan: NASA established a formal Return to Flight (RTF) Planning Team to manage all aspects of a safe return to flight, including complying with the recommendations of the Columbia Accident Investigation Board. The Space Flight Leadership Council, co-chaired by the Associate Administrator for Space Operations and the Deputy Chief Engineer for Independent Technical Authority, assessed the options and recommendations from the RTF Planning Team. Through this process, NASA identified the technical causes and systemic cultural, organizational, and managerial issues associated with the *Columbia* accident. NASA then addressed the deficiencies by implementing a governance structure that includes forums for open discussions of technical and safety issues.

Following the completion of major test flight objectives on STS-121 in July 2006, only one vehicle modification remains—the Ice Frost Ramp design—scheduled for testing in February 2007 aboard STS-117. Therefore, NASA's Operations Management Council removed the Space Shuttle RTF as a material weakness based on evidence that the technical and cultural issues contributing to the *Columbia* accident have been corrected.

Financial Management Data Integrity

FMFIA Section 2 Weakness

Responsible Official: Chief Financial Officer

Description: This material weakness focused on two identified challenges: Fund Balance with Treasury differences and estimating environmental liabilities. Weaknesses in NASA's procedures for reconciling items resulted in unexplained differences in the Agency's Fund Balance with Treasury account, as compared to Treasury balances. Weaknesses in NASA's procedures for generating estimates of its Unfunded Environmental Liabilities resulted in a lack of auditable evidence to support estimates of environmental liabilities.

Corrective Action Plan: NASA established additional reconciliation controls and procedures at all Centers and at Headquarters to assure consistent access to the data required for Agency oversight. NASA also developed and implemented a process for estimating environmental liabilities in a consistent manner and held joint training classes for the environmental engineers and accountants responsible for identifying and reporting environmental liabilities to assure consistent application of policies and procedures. Additional performance reporting, in the form of a monthly review of Center corrective action plans and monthly financial metrics, also contributed to resolution of this weakness. As a result of these improvements, the Operations Management Council removed this item from the reported material weakness list.

Office of the Inspector General Statement on Material Weaknesses at the Agency

National Aeronautics and
Space Administration

Office of Inspector General
Washington, DC 20546-0001

NOV 9 2006

TO: Administrator

FROM: Inspector General

SUBJECT: NASA's Most Serious Management and Performance Challenges

As required by the Reports Consolidation Act of 2000, these are our views of the most serious management and performance challenges facing NASA. NASA is working to address these challenges and improve Agency programs and operations through various initiatives and by implementing recommendations made by the Office of Inspector General (OIG) and other evaluative bodies, such as the Government Accountability Office (GAO). An overarching challenge concerns how the Agency integrates diverse programmatic and institutional functions that are geographically dispersed. Each of the five challenges listed below, and summarized in the enclosure, is colored by this overarching challenge.

- **Transitioning from the Space Shuttle to the Next Generation of Space Vehicles.** Effectively planning, implementing, and measuring transition activities while maintaining the capabilities required to fly the Space Shuttle safely and effectively.

- **Managing Risk to People, Equipment, and Mission.** In the context of very challenging launch and mission schedules, ensuring that risk management, safety, and mission assurance controls operate robustly and reliably.

- **Financial Management.** Continuing to resolve internal control problems, which led to four consecutive disclaimers of opinion on NASA's financial statements, including FY 2006, and ensuring that the Integrated Enterprise Management Program (IEMP) improves NASA's ability to accurately allocate costs to programs, efficiently provides reliable information to management, and supports compliance with the Chief Financial Officers Act.

- **Information Technology (IT) Security.** Continuing efforts to enhance IT security by addressing significant weaknesses in controls.

- **Acquisition and Contracting Processes.** Ensuring that requirements are identified before the start of each project and that resources are properly matched with those requirements during the execution of the project.

Transitioning from the Space Shuttle to the next-generation space vehicles, which is key to implementing the President's Vision for Space Exploration,[1] was added as a most serious challenge last year. A draft OIG audit report on the transition process[2] discusses NASA's lack of a comprehensive transition plan that addresses issues critical for efficient and effective management of that process.

The Agency has focused considerable effort on safely returning the Space Shuttle to flight and completing the International Space Station. As a result, we removed the completion of the International Space Station from this year's challenges and refocused last year's challenge of "Continuing to Correct the Serious Organizational and Technical Deficiencies that Contributed to the Columbia Accident in 2003" to "Managing Risk to People, Equipment, and Mission."

NASA's financial management remains on the list of challenges because of continued internal control weaknesses affecting the Agency's ability to produce complete and accurate financial statements. In addition, during FY 2006, we reported on Antideficiency Act violations that the Administrator was required to report to the President, Congress, and the Office of Management and Budget.

Although we removed IT security from last year's list of challenges, we have again included it as a most serious management and performance challenge. The Agency has been responsive to our recommendations, and the Office of the Chief Information Officer has implemented policies and procedures that strengthen the Agency's IT security internal controls. However, our audit and investigative work shows that significant weaknesses persist and many IT security challenges remain.

In the past, various aspects of NASA's acquisition process and contract management have been included as a most serious management challenge. Over the past year, OIG and GAO audits and investigations have revealed additional indications of systemic problems in these areas, leading to the addition of the acquisition and contracting processes as a management challenge this year.

If you have any questions, or need additional information, please call me at 202-358-1220.

Robert W Cobb

Robert W. Cobb

Enclosure

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[1] "A Renewed Spirit of Discovery: The President's Vision for U.S. Space Exploration," January 2004.

[2] The final audit report will be issued in December 2006.

NASA's Most Serious Management and Performance Challenges

Transitioning from the Space Shuttle to the Next Generation of Space Vehicles

As part of the President's 2004 Vision for Space Exploration, NASA was directed to return the Space Shuttle to flight as soon as practical, focus the use of the Space Shuttle to complete the International Space Station (ISS), and retire the Space Shuttle by 2010. With respect to the broader space mission, the President directed NASA to develop new vehicles to provide crew transportation for missions beyond low Earth orbit. One of the key challenges associated with achieving the President's Vision is for NASA to maintain the capabilities required to fly the Space Shuttle safely and effectively while transitioning human capital and critical skills, real and personal property, and related capabilities to support projects within the Constellation Systems Program,[3] such as the Crew Exploration Vehicle (CEV) and the Crew Launch Vehicle (CLV).

To manage the transition, NASA established a Transition Governance Structure comprising transition managers and control boards appointed at the Agency, Directorate, Center, program, and project levels. The Transition Governance Structure includes representatives from two of NASA's four Mission Directorates—the Space Operations Mission Directorate (SOMD) and the Exploration Systems Mission Directorate (ESMD)—and representatives from NASA's Mission Support Offices. SOMD is responsible for operating the Space Shuttle Program (SSP) until its retirement in 2010 and for managing the completion and use of the ISS. ESMD is responsible for the Constellation Systems Program. The Mission Support Offices provide the institutional capabilities to support transition. The responsibilities of the transition managers and control boards include evaluating transition decisions to ensure that the decisions promote efficiencies and synergies between the human space flight programs; ensuring that existing infrastructure and resources evolve to future programs; and ensuring that strategies, decision-making, priorities, budgets, schedules, and top-level development and operational requirements are coordinated among ESMD, SOMD, and the appropriate Mission Support Offices.

In addition to establishing the Transition Governance Structure, NASA also developed a draft transition plan describing how the Agency will transition from operating the Space Shuttle and the ISS to flying the CEV and exploring the Moon and beyond. Version 7 of the draft transition plan, "Human Space Flight Transition Plan," undated, discusses topics such as transition management, acquisition, budget, data and records management, environmental management, human capital, information technology, property, and transition metrics. NASA is also developing the National Space Transportation System 07700, Volume XX, "Space Shuttle Program Transition and Retirement Requirements," to document the requirements for managing the SSP's end-of-program transition.

[3] The Constellation Systems Program is responsible for developing the next-generation space vehicles and the related exploration architecture systems.

The success of the transition effort is dependent on the development of a comprehensive plan for the transition and the timely execution of that plan.[4] The comprehensive plan must focus on transition requirements and how those requirements intersect with the requirements of three major programs involved in transition—Space Shuttle, ISS, and Constellation—recognizing that changes in requirements within any of those programs will not only have an effect on the overall transition effort but may also directly affect the other programs. Since the initial architecture for the next generation of space vehicles was announced, NASA has revised the size, configuration, and hardware for those vehicles and extended the completion date for the CEV. Because the initial architecture was developed to take advantage of SSP technology and workforce assets, the revisions not only impact the acquisition of the new vehicles, but may also impact SSP closeout activities.

The transition effort poses a tremendous challenge to NASA, and the planning, implementing, and measuring of transition requirements should be tracked from the highest management levels of the Agency.

Managing Risk to People, Equipment, and Mission

In FY 2006, NASA launched two Space Shuttle missions to the International Space Station notwithstanding concerns raised by engineers and safety officials. In January 2006, NASA proceeded with the New Horizons launch, also notwithstanding objections from safety and mission assurance officials. We have no basis to question the decision to proceed in any of these launches. Furthermore, we applaud the fact that those who have a technical basis to object to launch of missions are empowered to voice concerns. On the other hand, the lack of technical consensus at late stages of pre-launch activities suggests that launch vehicles' compliance with launch requirements is less than optimal.

In the context of the objective to complete the International Space Station by 2010, where a decision to forgo launching a Space Shuttle mission in a given launch window creates risk to meeting the objective, there is schedule pressure. NASA must guard against this pressure manifesting itself in the acceptance of undue risk. We recognize that the complex effort to balance mission execution in defined timeframes against the imperfections of hardware, while ensuring that a robust process exists for voicing safety and engineering concerns, is a serious performance and management challenge to the Agency.

Financial Management

In FY 2003, NASA converted its accounting data from 10 separate systems to a single Integrated Enterprise Management Program (IEMP). The backbone of IEMP is the Core Financial module. However, despite substantial investment, in both time and money, into the development and implementation of the Core Financial module, NASA still cannot produce

[4] The OIG initiated an audit in January 2006 to evaluate NASA's plans for managing the Space Shuttle's retirement and transition to the CEV and CLV. We expect to issue the audit report in December 2006.

auditable financial statements—a key goal of the module. NASA has made progress in addressing material weaknesses and other deficiencies but improving financial management remains a formidable challenge.

NASA received a disclaimer of opinion on its financial statements as a result of the Independent Public Accountant (IPA) audits in FY 2003 by PricewaterhouseCoopers and in FY 2004, FY 2005, and FY 2006 by Ernst & Young LLP (E&Y) because NASA has been unable to provide auditable financial statements and sufficient evidence to support statements throughout the fiscal year. The IPAs' reports identified instances of noncompliance with generally accepted accounting principles, reportable conditions (with most being material weaknesses) in internal controls, and noncompliance with the Federal Financial Management Improvement Act of 1996 and the Improper Payments Information Act of 2002. Many of the weaknesses the audits disclosed resulted from a lack of effective internal control procedures and data integrity issues.

Two of the most significant material weaknesses involve NASA's internal controls over property, plant, and equipment and materials (PP&E) and the financial statement preparation oversight and process. As shown in the following table, these weaknesses have been reported for several years.

Internal Control Deficiencies						
Fiscal Year		2006	2005	2004	2003	2002
Independent Public Accountant		E&Y	E&Y	E&Y	PwC[1]	PwC
Audit Opinion		Disclaimer	Disclaimer	Disclaimer	Disclaimer	Unqualified
Internal Control Deficiencies	General Controls Environment[2]	—	—	material weakness	reportable condition	reportable condition
	Property, Plant, and Equipment and Materials	material weakness	material weakness	material weakness	material weakness	material weakness
	Financial Statement Preparation Process and Oversight	material weakness	material weakness	material weakness	material weakness	material weakness
	Fund Balance with Treasury[3]	—	material weakness	material weakness	material weakness	—
	Audit Trail and Documentation to Support Financial Statements[4]	—	—	—	material weakness	—
	Environmental Liability Estimation[5]	—	reportable condition	reportable condition	—	—

[1] PricewaterhouseCoopers.

[2] The General Controls Environment weakness had mostly been resolved for FY 2005. The segregation of duties component of this weakness was included in the Financial Statement Preparation Process and Oversight weakness for FYs 2005 and 2006.

[3] The weakness cited for Fund Balance with Treasury reconciliations cited in FY 2005 had mostly been resolved; a weakness relating to timely resolution of Budget Clearing Account balances was included in the overall Financial Statement Preparation Process and Oversight weakness for FY 2006.

[4] The weakness on Audit Trail cited in FY 2003 continued to exist in subsequent years (FYs 2004–2006); however, it was included in the overall Financial Statement Preparation Process and Oversight weakness.

[5] The deficiency cited for Environmental Liability Estimation had mostly been resolved for FY 2006. Control deficiencies surrounding the software application used to prepare the estimates and a lack of appropriate OCFO involvement in related accounting matters were included in the Financial Statement Preparation Process and Oversight weakness for FY 2006.

NASA has made significant progress in correcting two of the four deficiencies noted in FY 2005; specifically, Fund Balance with Treasury (FBWT) and Environmental Liability Estimation. NASA demonstrated its progress in correcting the FBWT material weakness by substantially resolving outstanding reconciliation items from prior periods at year-end and introducing reconciliation procedures that track current period differences. For the Environmental Liability Estimation deficiency, progress was made in documenting the environmental liability estimation process and training the engineers who prepare the estimates.

NASA is also working to ensure that the Office of the Chief Financial Officer (OCFO) is adequately staffed to address its challenges, enhance the OCFO's financial management skills, and provide value-added financial management support to the Agency's mission. In September 2006, the OCFO completed a workforce planning assessment at Headquarters and each Center's OCFO.

Some of the challenges noted in the workforce assessment report are the need for an increase in

- analytical skills, understanding of full-cost accounting, and property accounting;
- project management knowledge;
- succession planning; and
- flexibility to respond to program, process, and policy changes.

The OCFO also needs to fill some key leadership positions, such as the Chief of the External Reporting Branch, who is responsible for preparing NASA's financial statements.

To further address its financial management deficiencies, NASA initiated the Systems, Applications, and Products (SAP) Version Update Project in September 2005 to update the Core Financial module to the most recent version of SAP. NASA plans to implement the update in November 2006. The update contains code fixes and redesigns based on issues encountered in previous versions of the software. Once the update is complete, NASA expects to have the ability to use the Agency's Operating and Execution Plans as the funds distribution control mechanism; establish lower levels of funds control; record commitments and obligations at their time of approval; more efficiently and effectively identify, investigate, and resolve errors on purchase orders; generate cost accruals; and streamline the year-end closing processes. According to NASA, those abilities will enhance its financial tracking and reporting capabilities, which are vital to achieving an unqualified audit opinion.

In response to a request by the House Committee on Science, Subcommittee on Space and Aeronautics, NASA prepared a corrective action plan to address the material weaknesses and recommendations noted in the FY 2005 financial statement audit report. NASA implemented periodic monitoring activities as an Agency-wide key control. These activities include reviewing and analyzing each Center's financial data to identify inaccurate data, abnormal balances, account relationship differences, and other financial reporting anomalies resulting in reporting discrepancies. While these monitoring activities identified issues requiring

immediate attention by NASA management, they could be improved because Headquarters guidance to the Centers is not always clear and is open to interpretation by Center personnel.

NASA still needs to ensure that it develops and implements comprehensive corrective action plans, within parameters set by financial management and accounting laws and regulations, which are the collaborative product of NASA program and institutional leadership. The plans must address the FY 2006 IPA findings and NASA's internally identified material weaknesses noted in the Administrator's Statement of Assurance, and the plans must be detailed enough to ensure successful implementation with desired results. The OIG will continue to work with Agency leadership toward solutions.

Information Technology (IT) Security

Despite the progress NASA made in improving its IT security program, systemic IT security weaknesses persisted and many IT security challenges remain. Specifically, our audits and assessments found recurring and significant internal control weaknesses related to IT security, including patch management, monitoring of critical system activities, backup of systems, and certification of IT systems. In addition, several NASA Centers have experienced IT security incidents, which the OIG is investigating. As a result, NASA's FY 2006 Federal Information Security Management Act report to the Office of Management and Budget identified the IT security program as a material weakness. Elevating NASA's IT security program to a material weakness should help focus management's attention and resource decisions on the program's shortcomings. In addition, the Deputy Administrator has mandated a comprehensive, NASA-wide IT security review that should result in recommendations to improve the Agency's IT security posture.

Because of the sensitivity of IT security vulnerabilities, we are not providing details on specific weaknesses in this document. However, we have provided the Agency detailed information on vulnerabilities as well as recommendations for corrective action in reports and other controlled documents.

Acquisition and Contracting Processes

In a December 2005 report to the Chairmen of the House and Senate Appropriations Committees, we identified a number of trouble areas in NASA's acquisition and contracting processes that were uncovered in our audit and investigative work, including

- inadequate control over Government property held by contractors,
- single-bidder contracts with undefined and changing contract requirements,
- lack of transparency to subcontractors working on NASA programs,
- questionable contract management practices under NASA's Small Business Innovation Research (SBIR) program,

- procurement process abuses by NASA employees and contractors, and
- significant cost overruns in some Agency programs.

GAO first identified NASA's contract management as a high-risk area in 1990 and reiterated that assessment in 2005, citing NASA's lack of a modern, fully implemented integrated financial management system; undisciplined cost-estimating processes in project development; and project mangers' inability to obtain information needed to assess contract progress. Over the past year, GAO audits have revealed additional indications of systemic problems in NASA's acquisition process.

Given that NASA spends about 85 percent of its annual budget on contracts, these weaknesses pose significant challenges to NASA's ability to make informed investment decisions and implement appropriate corrective actions.

Improving Acquisition Integrity. OIG audits and investigations during FY 2006 revealed continued, systemic problems in the contract area. The OIG has worked closely with the NASA Office of the General Counsel to promote NASA's implementation of a new Agency-wide Acquisition Integrity Program, which NASA leadership has endorsed. The program is designed to enhance NASA's internal control framework for ensuring integrity in its contracts, promoting competition in contracting, and identifying and addressing wrongdoing by contractors. As part of this, a remedy coordination official will ensure that there is an Agency-wide approach to NASA's administration of civil, administrative, and contractual remedies resulting from investigations, audits, or other examinations related to procurement activities. The new program will provide NASA with a more structured and thoughtful approach for administering contract remedies, sharing best practices, improving internal controls, and raising employee awareness of procurement fraud indicators.

Competition in Contracting. In December 2003, the OIG received allegations that the Boeing Company unfairly secured a NASA Launch Services task order for 19 NASA expendable launch vehicle missions using proprietary data from Lockheed Martin. An OIG investigation disclosed that Boeing's possession and use of Lockheed's proprietary data plus the unfair advantage the company had gained in the Air Force's Evolved Expandable Launch Vehicle Program contract enabled Boeing to persuade NASA to award the 19 expendable launch vehicle missions on a sole-source basis. NASA received $106.7 million from the $615 million settlement the U.S. Government received from Boeing for its improper use of proprietary data.

Undefinitized Contracts. In 2001, GAO identified undefinitized contracts as an issue requiring NASA management attention. Although the Agency appropriately addressed the findings raised by GAO, the issue has returned. A 2006 OIG audit report[5] on subcontract management noted that NASA took more than a year to definitize a contract action, which increased the risk of unanticipated cost growth and delayed NASA's ability to negotiate a fair

[5] "Subcontract Management by United Space Alliance under the Space Flight Operations Contract" (IG-06-013, August 28, 2006)

and reasonable cost. Another 2006 OIG audit report[6] identified that NASA experienced unanticipated cost growth when it issued a letter directing a contractor to commence building and roof repairs during the aftermath of Hurricane Katrina. NASA had estimated the work effort at $991,000, but because the work effort was unclear, and because there was no *Not-To-Exceed* amount in the "letter contract," the contractor later reported costs exceeding $7 million. Recently, the Agency again identified undefinitized contracts as an area warranting senior management attention and raised the question of whether the Agency had implemented sufficient internal controls to prevent the use of this form of contracting from becoming a management weakness.

Lack of a Knowledge-based Acquisition Framework. GAO found that NASA's acquisition policies lacked major decision reviews beyond the initial project approval phase and lacked a standard set of criteria with which to measure projects at crucial phases in the development life-cycle. In response, NASA agreed to apply a knowledge-based acquisition approach, to include incremental markers that ensured adequate knowledge is attained at key decision points before proceeding to the next project phase. A standardized, knowledge-based acquisition approach will help NASA evaluate competing budgetary priorities and enhance the Agency's ability to make difficult decisions regarding investments and the continuation of projects. It is imperative that results of the decision reviews be monitored and reported to the appropriate decision authority where decision makers can reassess whether continued investment in a program or project is warranted. For example, GAO stated that, to help mitigate risks to the CEV project, NASA must ensure that decision reviews are completed at key junctures during the project's development.

Managing Program Costs. In a review of selected NASA programs, GAO found that NASA lacked the disciplined cost-estimating processes and financial and performance management systems needed to establish priorities, quantify risks, and manage program costs. GAO noted that until NASA has the data, tools, and analytical skills needed to alert program managers of potential cost overruns and schedule delays, allowing them to take corrective action before problems occur, the Agency will continue to face challenges in effectively overseeing its contractors. NASA has experienced cost overruns on some of its major programs, most notably the International Space Station. The Agency has also disclosed that it experienced cost overruns in its effort to return the Space Shuttle to flight and the James Webb Telescope Program.

[6] "Final Memorandum on the Audit of the Management of Hurricane Katrina Disaster Relief Efforts" (ML-06-009, August 29, 2006)

Federal Financial Management Improvement Act

NASA assessed the Agency's financial management systems to determine whether they comply with the requirements of the *Federal Financial Management Improvement Act* (FFMIA) of 1996. The assessment was based on guidance issued by the Office of Management and Budget (OMB). NASA management agrees with the findings set forth in the independent auditor's Report on Compliance with Laws and Regulations.

NASA is in the process of implementing remaining corrective actions from its 2005 Corrective Action Plan that address the Agency's FFMIA weaknesses. Those corrective actions are intended to resolve the following:

- Certain weaknesses in financial management process controls, primarily related to the Agency's Property, Plant and Equipment;
- Limitations in NASA's Core Financial Module software that continue to require compensating controls and systems; and
- Incorrect postings to certain general ledger accounts due to system configuration or design issues.

As of September 30, 2006, NASA financial management systems do not substantially comply with federal financial management systems standards and requirements.

Improper Payments Information Act

The *Improper Payments Information Act* (IPIA) of 2002 requires federal agencies to review their programs and activities annually to identify those that are susceptible to risk. OMB guidance defines significant improper payments as annual improper payments in a Line of Business or Program that exceed both 2.5 percent of program payments and $10 million. Agencies are required to identify any programs and activities at risk, report the annual amount of improper payments, and implement corrective actions. NASA's improper payment risk assessments identify existing and emerging vulnerabilities that can be reduced through corrective actions and that may produce a corresponding increase in program savings for the Agency.

In FY 2006, NASA continued to improve the Agency's internal controls by establishing policies and procedures in NASA's *Financial Management Requirements* (FMR), *Volume 19: Periodic Monitoring Controls Activities*, and by requiring that all NASA Field Centers perform 23 financial reconciliations or verifications on a scheduled basis. The Agency also established a Quality Assurance Office within the Office of the Chief Financial Officer to provide direction and focus for NASA Internal Control activities.

NASA's Efforts to Identify Erroneous/Improper Payments

NASA reviews historical performance from the Office of the Chief Financial Officer to identify programs and activities susceptible to significant improper payments. NASA's assessed risk and actual results for the past three fiscal years have shown NASA's improper payments to be less than 2.5 percent of program payments and less than $10 million.

In FY 2006, the Office of the Chief Financial Officer expedited the identification and recapturing of improper payments that may have occurred at NASA Centers by implementing new processes based on OMB Memoranda M-03-07, *Programs to Identify and Recover Erroneous Payments to Contractors*. NASA further strengthened the Agency's approach for addressing IPIA requirements by conducting an erroneous/improper payment assessment on all the research and development contract disbursements processed between FY 1997 and FY 2005, with a cumulative value of approximately $57.5 billion, as depicted in the chart below. The assessment validated that NASA's susceptibility to improper payments is low under current guidance. (Note: The Improper Payment Reduction Outlook chart required by OMB Circular A-136, *Financial Reporting Requirements*, is not included in this report because NASA identified no programs susceptible to significant risk.)

NASA's Planned Fiscal Year 2007 IPIA Compliance Approach

In FY 2007, NASA plans to perform a risk assessment of the Agency's commercial and non-commercial disbursement activities based on lessons learned from the FY 1997 to FY 2005 results of audit recovery activities (see table below), and guidance from OMB Memorandum M-06-23, *Issuance of Appendix C to OMB Circular A-123*, August 10, 2006. NASA also plans to re-compete the Agency's recovery audit services contract.

NASA's recovery audit results are shown below:

NASA FY 1997 to FY 2005 Recovery Audit Summary			
Agency Component	Actual Amount Reviewed and Reported	Amounts Identified for Recovery	Amounts Recovered, Current Year
Ames Research Center	N/A	$ 9,608.00	$ 9,608.00
Glenn Research Center	N/A	$ 6,254.00	$ —
Langley Research Center	N/A	$ —	$ —
Dryden Flight Research Center	N/A	$ 9,312.00	$ —
Goddard Space Flight Center	N/A	$ 17,634.87	$ —
Marshall Space Flight Center	N/A	$ 111,276.66	$ 111,276.66
Johnson Space Center	N/A	$ 99,200.00	$ 15,566.00
Kennedy Space Center	N/A	$ 2,969.00	$ 2,969.00
Total	**$ 57,439,000,000.00**	**$ 256,254.53**	**$ 139,419.66**

Legal Compliance

NASA's Annual Performance and Accountability Report must meet legislative and regulatory government-wide requirements established by Congress and OMB. The table below lists these requirements and indicates where in this Report each requirement is satisfied.

Summary of Legislative and Regulatory Requirements			
Legislation	Guidance	Summary of Requirements	Comments
Reports Consolidation Act of 2000	—	Authorizes the combining of performance and financial reports into a consolidated Performance and Accountability Report (PAR). Requires a statement on the reliability and completeness of the data contained in the report.	The statement of reliability and completeness is included in the Administrator's transmittal letter.
Government Performance Results Act of 1993	OMB Circular A-11 Part 6, *Preparation and Submission of Strategic Plans, Annual Performance Plans, and Annual Program Performance Reports* OMB Circular A-136, *Federal Financial Accounting Standards*	Provides for the establishment of strategic planning and performance measurement in the federal government. Mandates that agencies prepare strategic plans, performance plans, and report on the results.	Parts 1 and 2 of this report contain information on NASA's performance results for FY 2006.
Federal Managers Financial Integrity Act of 1982	OMB Circular A-123, *Management's Responsibility for Internal Control*	Requires ongoing evaluation of and reporting on the adequacy of the systems of internal accounting and administrative control.	The FMFIA statement is included in Systems, Controls, & Legal Compliance.
Federal Financial Management Improvement Act of 1996	January 4, 2001 OMB Memorandum, Revised Implementation Guidance for FFMIA	Requires a determination and report on the substantial compliance of agency systems with federal financial management system requirements, federal accounting standards, and the U.S. government Standard General Ledger at the transaction level.	FFMIA is addressed in Systems, Controls, & Legal Compliance.
Inspector General Act of 1978	OMB Circular A-136, *Federal Financial Accounting Standards*	Provides for independent review of agency programs and operations. Annual report of material weaknesses required in the PAR.	The Office of the Inspector General report of material weaknesses is included in Systems, Controls, & Legal Compliance.
The E-Government Act of 2002	—	Requires the agency's strategic plan be posted on the Agency's Web site.	NASA's Strategic Plan, budget, and PAR are available at *http://www.nasa.gov/about/budget/index.html*.
The Chief Financial Officers Act of 1990	OMB Circular A-136, *Federal Financial Accounting Standards*	Requires the Chief Financial Officer to submit a financial report to OMB. This report is consolidated with performance data under the *Reports Consolidation Act of 2000*.	See Part 3: Financials.
Improper Payments Information Act of 2002	OMB Memorandum M-06-23, *Issuance of Appendix C to OMB Circular A-123*, August 10, 2006	Requires an assessment of the potential for improper payments and a report of this assessment to Congress.	See Systems, Controls, & Legal Compliance.

Looking Ahead

Staying on Target and on Budget

To achieve the Vision for Space Exploration, NASA is focusing resources on tasks that will enable the Agency to achieve the Vision's goals in the target timeframes. In a February 2006 statement about NASA's FY 2007 budget request, NASA Administrator Mike Griffin stated that NASA is, and will continue to be, faced with making difficult decisions in setting priorities for the Agency's resources, time, and energy. For example, Agency management greatly scaled down near-term research and development within the Prometheus Nuclear Systems and Technology Program to free up funds for more pressing research and development. NASA also opted to keep the budgets for space and Earth science portfolios relatively flat in the five-year budget horizon. During the past decade, budget increases in these portfolios surpassed NASA's top-line budget growth, and NASA cannot sustain that growth rate. NASA will continue to fund operational missions, as well as priority missions in formulation or development, but by eliminating or deferring lower-priority missions, the Agency will control budget growth and free up resources for mandated human exploration initiatives.

Transitions

NASA will retire the Space Shuttle in 2010 and begin the Agency's transition to a new human-rated space transportation system, the Orion Crew Exploration Vehicle and the Ares family of launch vehicles. As part of this transition, NASA will move more than 1,000 employees from the Space Shuttle Program to the Constellation Systems Program and other understaffed areas. NASA also must transition surplus Shuttle facilities and assets for other uses.

To facilitate these considerable transitional tasks, NASA is conducting internal and external studies as a basis for formulating processes and establishing realistic timeframes that will support a smooth transition with the fewest negative impacts possible.

Maximizing NASA's Workforce

In FY 2006, NASA identified under-utilized personnel and skill gaps in the Agency's current and future workforce needs. At NASA's request, the National Research Council is conducting a study of issues affecting science and engineering workforce needs, particularly workforce trends in the future. The final report, due by the end of 2006, will provide reference information as NASA develops strategies for future workforce development and management.

In addition, NASA is gathering skill information on the Agency's current civil service employees using the Competency Management System (CMS). CMS is a new Agency-wide tool that will enable NASA to maintain a listing of workforce knowledge capabilities, align the expertise of the workforce to the Mission via the budget planning process, and increase staff capabilities in targeted knowledge areas. NASA's CMS team also will use CMS data on employee competencies to modify the process for analyzing future workforce competency gaps and to address

Developing the Workforce of the Future

NASA's continued success is built on a steady supply of highly skilled, dedicated, and diverse professionals. NASA's Education programs use the Agency's missions and research to spark student interest in science, technology, engineering, and mathematics (STEM) and prepare tomorrow's workforce for challenging STEM-related careers.

NASA's Education programs provide opportunities that allow undergraduate, graduate, and post-doctoral students to hone their skills and expand their knowledge by working alongside NASA scientists and engineers. Many programs target underrepresented and under-served communities to help create a more balanced national workforce. For example, the Jenkins Predoctoral Fellowship Program (JPFP), which creates opportunities for minorities, women, and individuals with disabilities, provides up to three years of financial support for graduate education leading to a doctoral degree in a NASA-related discipline. NASA scientists and engineers serve as research leads and mentors throughout a JPFP fellow's tenure to ensure their success. In summer 2006, NASA and the American Indian Higher Education Consortium (AIHEC) launched the NASA–AIHEC Summer Research Program, a strategic approach to inspire young American Indians to pursue STEM-related careers. Student–faculty teams from 14 of the Nation's 35 Tribal Colleges and Universities conducted research alongside mentors at NASA Centers on a broad range of subjects, including robotics, three-dimensional design, geospatial data analysis, and astrobiology.

Dr. Shavesha Anderson, an aerospace engineer and JPFP alumni fellow, conducts research in the area of analytical chemistry. She participated in JPFP while pursuing a Ph.D. in chemistry at the American University in Washington, D.C. After completing her degree, she joined the workforce at NASA's Goddard Space Flight Center. (NASA)

employee development needs through the Agency's new System for Administration, Training, and Educational Resources for NASA (SATERN). In the future, NASA will use CMS to link together people with the same or similar competencies into communities of practice. Managers will be able to search through these communities of practice to find employees, positions, or organizations with desired competencies, helping NASA to maximize available workforce, partner across organizations or Centers, and disseminate information relevant to a community.

Improving Agency Management

NASA is improving management of the Agency's finances and physical and human resources, assets, and processes through a combination of supporting technology and business infrastructure.

During FY 2006, the Integrated Enterprise Management Program (IEMP) developed for implementation in FY 2007 an updated version of the SAP Core Financial software to improve the Financial system's compliance with federal financial and accounting systems standards and to respond to recommendations from the Government Accountability Office. The SAP Version Update project will help improve the quality of financial and management information available for Agency decision-making, streamline the funds-distribution process, and stabilize the impact of converting to full-cost accounting on programs and projects. The updated software also should help NASA make progress towards achieving a clean audit opinion on future fiscal year-end financial statements, as well as a "Green" rating on the President's Management Agenda (PMA) scorecard for "improved financial performance."

In the coming year, IEMP will implement a number of tools to enhance Agency operations:

- The Contract Management Module, a tool to support contract/grant writing and administration, procurement workload management, and data reporting and management. NASA will implement the Contract Management Module at the same time as the SAP Version Update;
- The Aircraft Management Module, an integrated toolset that will help NASA manage the Agency's fleet of mission-support, research, and mission-management aircraft by tracking aircraft inspections, mission configurations, and aircrew qualifications and status to help NASA control and reduce the cost of operations; and
- eTravel, a government-wide, Web-based travel management service that includes self-service travel booking, authorization, and vouchering. This initiative, part of the PMA EGovernment effort, will simplify the travel process for employees and help NASA track, manage, and control travel expenses.

IEMP also is planning initiatives for implementation by the end of the decade:

- The Property, Plant, and Equipment (PP&E) module will focus on the accountability, valuation, and tracking of internal-use software, program/project assets, and personal property that is either NASA-owned and held or NASA-owned and contractor-held. The project team plans to use the Department of Energy's Oak Ridge National Laboratory version of SAP PP&E implementation as a model for processes and configuration.
- The Human Capital Information Environment, which will provide online access to near-real-time human captial information;

In March 2006, NASA opened the NASA Shared Services Center (NSSC) at Stennis Space Center in Mississippi. This public/private partnership between NASA and Computer Sciences Corporation Service Providers consolidates all Agency support services, including financial management, human resources, information technology, and procurement. NASA is transitioning support services to NSSC in phases. In FY 2007, NASA will complete the moves of employee services and payroll, procurement, contract services, and information technology and will begin to transition Small Business Innovative Research/Small Business Technology Transfer. Accounts payable and receivable will be the last major service elements to transition, scheduled for FY 2008.

Thinking (and Contracting) Outside of the Box

To increase Agency efficiencies, NASA is seeking ways to leverage technology and additional capabilities available through commercial industry, other federal agencies, academia, and international partners.

In August 2006, NASA signed Space Act Agreements with two commercial companies—Space Exploration Technologies and Rocketplane–Kistler—to develop and demonstrate commercial orbital transportation services that can deliver crew and cargo to the International Space Station (ISS). Should they successfully demonstrate their cargo transportation capabilities, they will be able to bid to provide cargo transportation services for the ISS after Shuttle retirement. Space Exploration Technologies plans to begin demonstrations of its Falcon 9 reusable launch vehicle and Dragon spacecraft in late FY 2008. Rocketplane–Kistler also plans the first launch of its K–1 launch vehicle in early FY 2009. If these new commercial partnerships are successful, the resulting vehicles will increase NASA's options for launching cargo to the ISS as the Agency transitions from the Shuttle to the Ares and Orion space transportation elements.

To encourage emerging commercial launch service providers and potentially provide significant cost savings to the science and exploration community, the Agency modified the NASA Launch Services contract to allow onto the contract new proposers who have not yet had a successful flight. By August, an alternate launch provider responded to the contract modification with a proposal that currently is under evaluation. In addition, NASA conducted a study of emerging launch providers. During summer 2006, a cross-Agency team visited four out of an initial 40 emerging launch service providers to gather information and evaluate their maturity and ability to satisfy NASA's mission requirements.

In September, NASA formed a unique partnership with Red Planet Capital, Inc., to give NASA earlier and broader exposure to emerging technologies. Red Planet Capital, a non-profit organization, will use venture capital and a NASA investment of approximately $75 million over five years to attract private-sector technology innovators and investors who typically have not done business with the Agency. NASA will provide strategic direction and technical input to this partnership to assure that it complements other NASA strategies to promote private sector participation in space exploration.

Strengthening International Relationships and Collaboration

International partnerships are playing an increasing role in space exploration as robotic and human missions become more complex and more expensive. Through international partnerships, NASA and the space agencies of other nations can pool resources and capabilities while forging unique international alliances.

Administrator Mike Griffin and G. Madhavan Nair, Chair of the Indian Space Research Organization, signed two Memoranda of Understanding in May 2006 stating that NASA will provide two scientific instruments for India's Chandrayaan–1 lunar orbiter mission, scheduled to launch in FY 2008. This follows the Joint Statement of July 18, 2005, signed by President George W. Bush and Indian Prime Minister Singh, pledging to build closer ties between the United States and India in space exploration, satellite navigation and launch, and commercial space enterprise. NASA's contributions to Chandrayaan–1 will include the Moon Mineralogy Mapper, which will assess the Moon's mineral resources, and the miniature synthetic aperture radar, which will look for ice deposits in the Moon's polar regions. The Chandrayaan–1 mission also will give NASA additional information about the lunar environment as the Agency prepares for future robotic and human lunar missions.

In September 2006, NASA's Administrator met in China with Laiyan Sun, administrator of the China National Space Administration. This was the first time a NASA Administrator has visited China.

The two administrators discussed the space exploration goals of their respective countries and agencies, and the visit marked a first, tentative step toward U.S.–China cooperation in space exploration. Because of political considerations, the two countries are constrained in what they can discuss, and no human-spaceflight cooperative efforts are under consideration. A protocol agreement signed by John Marburger, director of the White House Office of Science and Technology Policy and the President's science advisor, and Xu Guanhua, China's minister of science and technology, allows the countries to exchange scientific and technical knowledge and to pursue advanced and applied technology projects in specific research areas, including Earth and atmospheric sciences.

On his first day of visiting China, Administrator Mike Griffin presents a picture montage with a flown American and Chinese flags to Dr. Yuan Jiajun, President and CEO of the China Academy of Space Technology. The next day, Griffin and astronaut Shannon Lucid spoke to graduate students at the Chinese Academy of Sciences about the U.S. space program. (NASA)

Part 2: Detailed Performance Data

Previous page: Researchers at NASA's Langley Research Center prepare a 21-foot-wingspan, 8.5-percent-scale prototype of a blended wing body aircraft for testing at Langley's historic full-scale wind tunnel. Boeing Phantom Works has partnered with NASA and the Air Force Research Laboratory to study the structural, aerodynamic, and operational advantages of the advanced aircraft concept, which is a cross between a conventional plane and a flying wing design. (Boeing Phantom Works/B. Ferguson)

Above: Engineers at NASA's Dryden Flight Research Center conduct vibration testing on the F-15B testbed aircraft to prepare it for test flights of the Quiet Spike sonic boom mitigator. Researchers at NASA and Gulfstream Aerospace developed the telescopic Quiet Spike (shown here extended from the nose of the aircraft) as a means of controlling and reducing the sonic boom caused by an aircraft "breaking" the sound barrier. (NASA/T. Landis)

Detailed Performance Data

NASA's Performance Rating System

In February, NASA issued the 2006 NASA Strategic Plan, reflecting the Agency's focus on achieving the Vision for Space Exploration through six Strategic Goals and, under Strategic Goal 3, six Sub-goals. At the same time, NASA updated the Agency's FY 2006 Performance Plan to include multi-year and annual performance metrics that NASA will pursue in support of the new Strategic Goals.

Part 2: Detailed Performance Data describes each Strategic Goal and Sub-goal and provides a detailed performance report and color rating, including trend data, for each of NASA's 37 multi-year Outcomes and 165 Annual Performance Goals (APGs). The FY 2006 NASA Performance Improvement Plan, included at the end of this part, provides further information on performance shortfalls and the Agency's plans to achieve the unmet multi-year Outcomes and APGs in the future.

NASA managers assign annual performance ratings to each multi-year Outcome and APG based on a number of factors, including internal assessments of performance against plans in such areas as budgets, schedules, and key milestones. Managers also consider input from external reviewers, including NASA advisors and experts from the science community, as well as recommendations from the Office of Management and Budget.

NASA rates performance as follows:

Multi-year Outcome Rating Scale

Green	NASA achieved most APGs under this Outcome and is on-track to achieve or exceed this Outcome.
Yellow	NASA made significant progress toward this Outcome, however, the Agency may not achieve this Outcome as stated.
Red	NASA failed to achieve most of the APGs under this Outcome and does not expect to achieve this Outcome as stated.
White	This Outcome was canceled by management directive or is no longer applicable based on management changes to the APGs.

APG Rating Scale

Green	NASA achieved this APG.
Yellow	NASA failed to achieve this APG, but made significant progress and anticipates achieving it during the next fiscal year.
Red	NASA failed to achieve this APG, and does not anticipate completing it within the next fiscal year.
White	This APG was canceled by management directive, and NASA is no longer pursuing activities relevant to this APG.

In FY 2006, NASA achieved 84 percent of the Agency's 37 multi-year Outcomes, as shown in Figure 1. NASA also achieved 70 percent of the Agency's 165 APGs. NASA rated 12 percent of the Agency's APGs Yellow and 18 percent either Red or White. In previous years, NASA rated performance that exceeded expectations and

measures Blue; however, NASA discontinued this rating as of FY 2006. (See Figure 2 for a summary of NASA's APG ratings for FY 2006.)

Figure 1: Summary of NASA's FY 2006 Multi-year Outcome Ratings

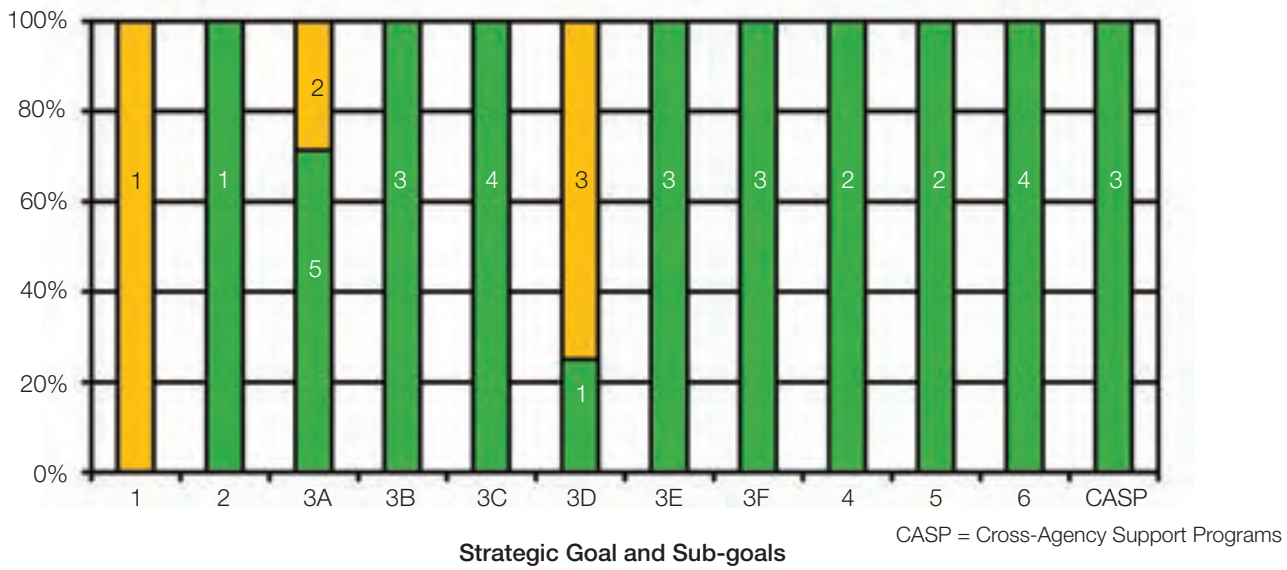


Figure 2: Summary of NASA's FY 2006 APG Ratings

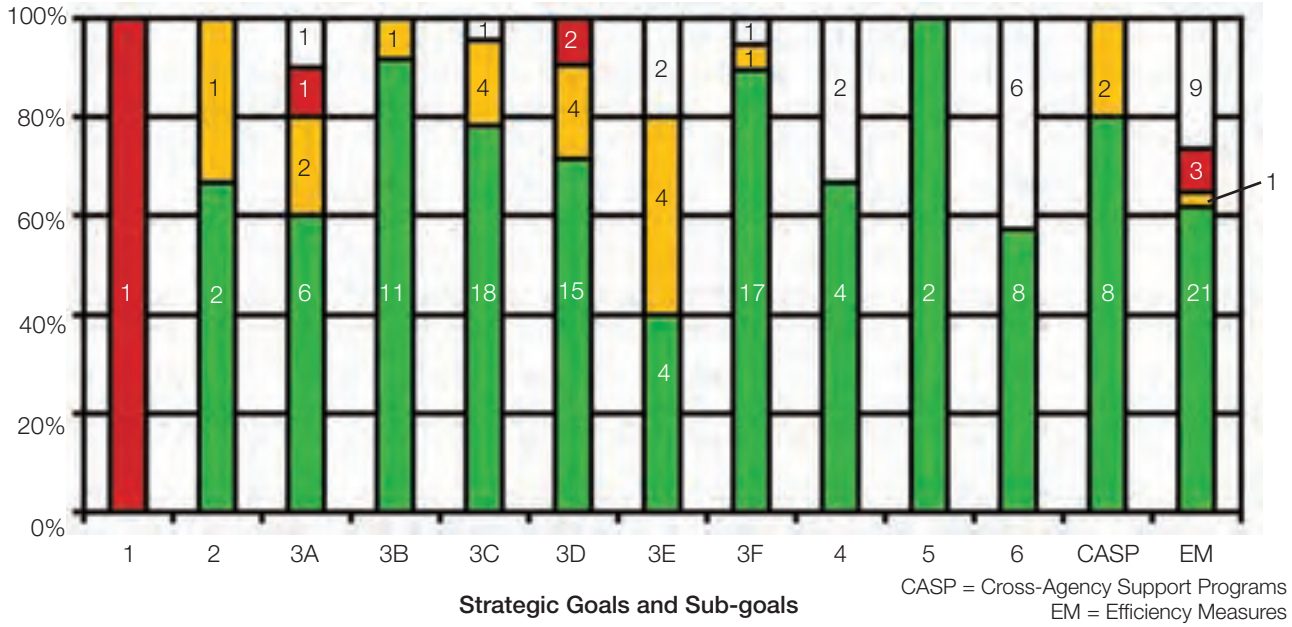
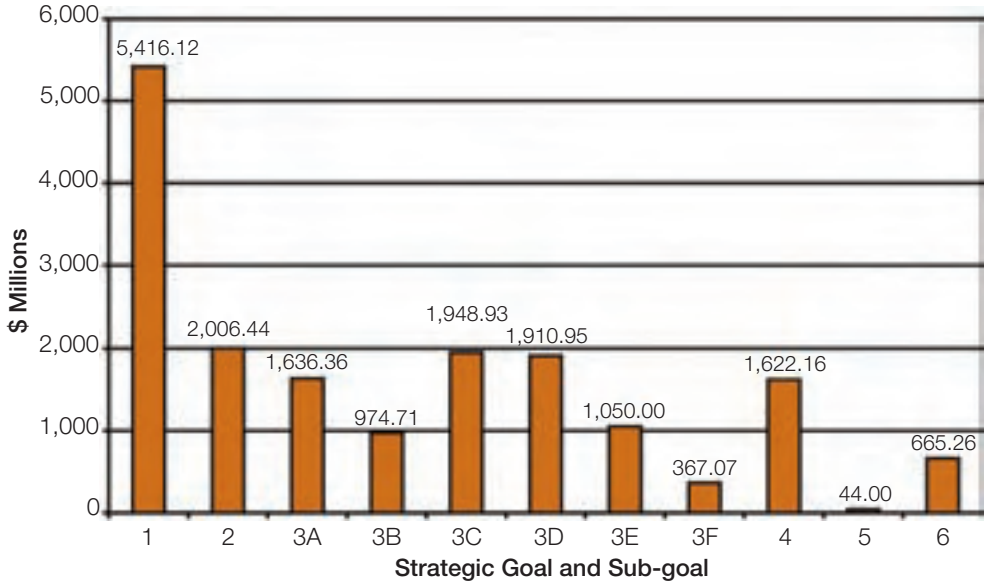


Figure 3 shows an estimate of NASA's FY 2006 expenditures toward achieving each Strategic Goal and Sub-goal. NASA's financial structure is not based on the Strategic Goals; it is based on lines of business that reflect the costs associated with the Agency's Mission Directorate and Mission Support programs. To derive the estimate of expenditures, NASA analysts reviewed and assigned each Agency program to a Strategic Goal (and Sub-goal, when appropriate), then estimated the expenditure based on each program's percentage of the business line

reflected in that Strategic Goal (and Sub-goal, when appropriate). This method does not allow NASA to estimate expenditures by multi-year Outcomes or APGs. However, NASA is making progress in aligning the Agency's budget and financial structure with performance, and the Agency plans to report expenditures by multi-year Outcomes as soon as possible.

The numbers provided in the figure below and throughout the Measuring NASA's Performance chapter in Part 1: Management Discussion & Analysis are derived from the FY 2006 Statement of Net Cost included in Part 3: Financials.

Figure 3: FY 2006 Cost of Performance for NASA's Strategic Goals and Sub-goals



Strategic Goal 1 *Fly the Shuttle as safely as possible until its retirement, not later than 2010.*

By Presidential direction, NASA will retire the Space Shuttle in 2010 to make way for a new generation of space transportation vehicles with the capability to travel beyond low Earth orbit to the Moon and beyond. Currently, the Shuttle is the largest human-rated space vehicle in the world, capable of delivering both crew and massive equipment to low Earth orbit. This capability makes the Shuttle critical to completing the International Space Station (ISS) and fulfilling the Vision for Space Exploration.

The Agency has three Shuttles in operation: *Discovery*, *Atlantis*, and *Endeavour*. NASA plans 15 to 17 Shuttle flights to support ISS assembly, plus a possible Hubble Servicing Mission before retiring the Shuttle.

In FY 2006, NASA flew two successful Shuttle missions: STS-121 and STS-115, the first ISS assembly mission since STS-113 in November 2002. During both missions, the Agency tested new techniques for monitoring the launch, examining the Shuttle for potential damage during launch, and conducting on-orbit repair to assure Shuttle integrity and crew safety.

The drag chute glows in the lights illuminating *Atlantis* as it touches down at Kennedy Space Center before dawn on September 21, 2006. The mission, STS-115, marked NASA's return to regular Shuttle flights and ISS construction. (NASA)

Risks to Achieving Strategic Goal 1

The current ISS assembly schedule leaves little room for delays in launching the Shuttle. However, the safety of the Shuttle's crew is paramount, and NASA will not compromise safety for schedule. The primary external risk facing the Space Shuttle Program is inclement weather. NASA officials delayed launching STS-115 several times due to lightning, high winds, and the impact of Hurricane Ernesto. Hurricanes also have the potential to cause significant damage to the NASA facilities that support Shuttle launches.

The Space Shuttle Program also faces internal risks associated with transitioning the Shuttle's workforce and facilities to support the Agency's new Constellation Systems Program, which will build NASA's next-generation space vehicles. In addition, NASA may face cost and schedule problems if any in-flight anomalies or other unacceptable

NASA Celebrates 25th Anniversary of First Shuttle Flight

On the morning of April 12, 1981, two astronauts, Commander John Young and pilot Robert Crippen, sat strapped into their seats on the flight deck of a radically new spacecraft known as the Space Shuttle, ready to make the boldest test flight in history. Designated STS-1, this first launch of Shuttle *Columbia* marked the inaugural flight of NASA's newest space transportation system and the first time a space vehicle was crewed during its maiden voyage.

In April 2006, as part of the 25th anniversary of this historic flight, NASA Administrator Michael Griffin awarded Robert Crippen the Congressional Space Medal of Honor, the Nation's highest award for spaceflight achievement. John Young received the award in 1981.

"It is unlike any other thing that we've ever built," said Crippen. "Its capabilities have carried several hundred people into space, it's carried thousands of pounds of payload into space. It gave us Hubble, it gave us Galileo, it gave us Magellan. And it's allowed us to essentially build a space station, although we've got some work still to do on that. So it is something that has been truly amazing and I'm honored to have been a part of it." The past 25 years of Shuttle flights are a testimony to NASA's dedicated workforce—the people who came together to make the Shuttle missions possible.

Above: John Young (left) and Robert Crippen pose with a model of *Columbia* for the first official Shuttle crew portrait. (NASA) Left: STS-1 launches from Kennedy Space Center on April 12, 1981. (NASA)

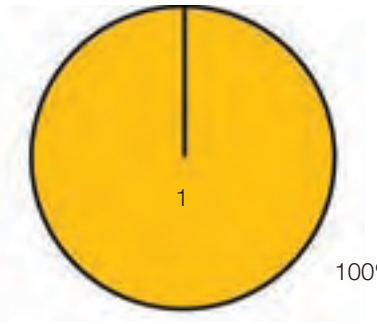
program and flight risks occur beyond the scope of Space Shuttle Program reserves. If the Space Shuttle Program is delayed dramatically, NASA may not complete all ISS elements as currently agreed on with the Agency's International Partners by Shuttle retirement in 2010.

Resources, Facilities, and Major Assets

The Space Shuttle Program currently occupies 640 facilities at multiple NASA Centers and uses over 900,000 pieces of equipment. The primary operational hardware includes the three operational Shuttles and the Shuttle preparatory and launch facilities at the Kennedy Space Center, including the Vehicle Assembly Building, where the Shuttle is connected to its external tank and solid rocket boosters, the large crawler transporter that carries the Shuttle to the launch pad, and the launch tower at pad 39A. The Michoud Assembly Facility in New Orleans manufactures the external tanks and ships them to Kennedy.

The cost of performance for Strategic Goal 1 during FY 2006 was $5,416.12 million.

Outcome Rating



Under Strategic Goal 1, NASA may not achieve the single Outcome as stated.

APG Rating

Under Strategic Goal 1, NASA failed to achieve the single APG.

Outcome 1.1: Assure the safety and integrity of the Space Shuttle workforce, systems and processes, while flying the manifest.

FY 2006	FY 2005	FY 2004	FY 2003
Yellow	Green	Green	None

In FY 2006, the Space Shuttle Program successfully flew two missions. STS-121 (*Discovery*), launched on July 4, 2006, was the Agency's second return to flight mission. It gave NASA engineers another opportunity to address the issue of foam loss from the Shuttle's external tank during liftoff—a problem that led to the *Columbia* accident and occurred again on the first post-*Columbia* accident mission, STS-114, launched in July 2005.

NASA continued to implement improvements introduced during the STS-114 mission: a new suite of cameras and sensors to monitor the Shuttle during launch; additional orbital maneuvers near the ISS to allow crew to check for damage; and ground procedures to provide mission managers with the high-fidelity information needed to assess Shuttle integrity. During the STS-121 mission, *Discovery* delivered cargo and supplies to the ISS and several science experiments, and crewmembers conducted spacewalks to repair the ISS Mobile Transporter, hardware critical to completing ISS construction. The second FY 2006 Shuttle mission, STS-115 (*Atlantis*), launched

Staff at Kennedy Space Center's Mission Control Center cheer and wave American flags as STS-121 launches on July 4, 2006. This was NASA's second return to flight mission and the first time the Agency had launched a Shuttle mission on Independence Day. (NASA)

on September 9. *Atlantis* crewmembers successfully conducted three complex spacewalks to install the P3/P4 truss segment on the ISS and to deploy four large solar arrays.

Despite the achievements during these two missions, NASA confirmed two Type–B mishaps (damage to property of at least $250,000 or permanent disability or hospitalization of three or more persons): damage to *Discovery*'s robotic manipulator arm caused while crews were servicing the Shuttle in the Orbiter Processing Facility hangar; and damage to *Atlantis*'s coolant loop accumulator due to over-pressurization. NASA also reported a personnel injury at Kennedy Space Center's Launch Complex 39A. NASA convened a Mishap Investigation Board to decide how to classify the incident, determine the root causes, recommend corrective actions, and report their findings to NASA and other stakeholders.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6SSP1 Red	Achieve zero Type–A (damage to property at least $1M or death) or Type–B (damage to property at least $250K or permanent disability or hospitalization of 3 or more persons) mishaps in 2006.	5SSP1 Green	4SSP2 Yellow	3H06 Red

Performance Shortfalls

Outcome 1.1 and 6SSP1: The Space Shuttle Program reported and investigated three major incidents in FY 2006. Two of these are confirmed Type–B mishaps. NASA is reviewing details of the third incident.

Strategic Goal 2 *Complete the International Space Station in a manner consistent with NASA's International Partner commitments and the needs of human exploration.*

The International Space Station (ISS) plays a vital role in NASA's human space exploration efforts by providing an on-orbit facility where researchers can study the effects of space travel on human health and performance over extended periods of time. NASA also uses the ISS to test technologies, capabilities, and processes for future human and robotic missions to the Moon, Mars, and beyond.

NASA launched Space Shuttle *Discovery*, STS-121, on July 4, 2006, the second return to flight mission since the *Columbia* accident in 2003 and a precursor to launching additional ISS hardware on future Shuttle flights. The mission tested new safety measures and changes to the external tank and delivered cargo and supplies to the ISS, including a piece of replacement hardware for the ISS Mobile Transporter and several science experiments. On September 9, NASA resumed ISS assembly with the launch of Shuttle *Atlantis*, STS-115. *Atlantis* ferried a major piece of infrastructure to the ISS, the P3/P4 integrated truss segment, which will provide additional power to support future modules and has a mechanism to rotate the truss sections to keep the solar arrays pointed at the Sun as the ISS orbits.

The new P3/P4 truss and solar panels are visible (running from the upper left corner to the center) in this photo taken by Shuttle *Atlantis* as it undocked from the ISS on September 17, 2006. (NASA)

Risks to Achieving Strategic Goal 2

NASA's ISS assembly schedule has limited reserves for internal and external factors that could potentially delay completion of the ISS beyond 2010. However, NASA remains committed to completing the ISS on schedule to fulfill the Vision for Space Exploration and to meet the Agency's commitments to the International Partners.

NASA enjoys the benefits of partnerships with the other nations contributing to the ISS. These partnerships enhance the Agency's ability to achieve NASA's Strategic Goals while also benefiting partner nations. However, international space agency partnerships contain multiple risks inherent with each partner country. NASA's ability to maintain international partnerships, even as world conditions and international relationships change, is important to the success of the International Space Station.

Internally, NASA must manage one of its biggest challenges: assuring a skilled and focused workforce for continued ISS and Shuttle operations while developing the post-Shuttle workforce. During FY 2006, NASA conducted internal workforce studies, and requested a workforce study by the National Research Council, to help Agency leaders develop strategies both for transitioning staff from the Space Shuttle Program to operations supporting Constellations Systems vehicle development and for assuring a highly trained, skilled workforce for current and future needs.

Resources, Facilities, and Major Assets

The single largest facility and asset supporting Strategic Goal 2 is the ISS. It represents dollar, human resource, and physical asset investments by the United States, Russia, Canada, and the European Space Agency. NASA also is processing two new modules, provided by the European Space Agency and the Japan Aerospace Exploration Agency, for launch by Shuttle in late 2007 and 2008, respectively.

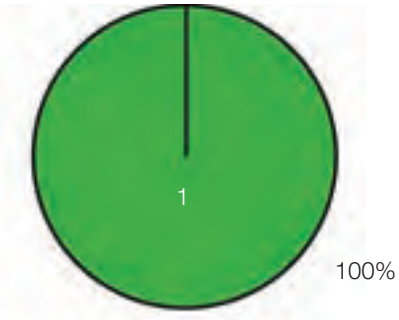
Other major resources also support Strategic Goal 2:

- The Space Shuttle fleet, the only vehicles able to carry large components to the ISS;

- The Space Station Processing Facility located at Kennedy Space Center, where NASA prepares equipment for launch;
- The Mock-up Facility at Johnson Space Center, where ISS expedition crews prepare for their missions using duplicates of on-orbit equipment and facilities; and
- The Neutral Buoyancy Laboratory at Johnson Space Center, a 6.2 million-gallon pool where expedition crews and Shuttle astronauts train for extravehicular activities like ISS construction in a simulated weightless environment.

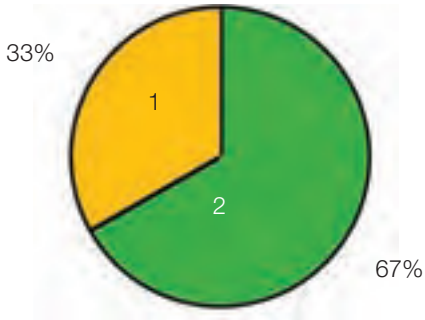
The cost of performance for Strategic Goal 2 during FY 2006 was $2,006.44 million.

Outcome Rating



Under Strategic Goal 2, NASA is on track to achieve the single Outcome.

APG Ratings



Under Strategic Goal 2, NASA achieved 2 of 3 APGs.

Outcome 2.1: By 2010, complete assembly of the U.S. On-orbit segment; launch International Partner elements and sparing items required to be launched by the Shuttle; and provide on-orbit resources for research to support U.S. human space exploration.

FY 2006	FY 2005	FY 2004	FY 2003
Green	Green	None	None

With the installation of the P3/P4 truss by the STS-115 crew in September 2006, NASA took a major step toward completing the ISS. With its solar panels fully extended, the P3/P4 truss will supply the completed ISS with a quarter of its power. The current wiring configuration restricts power generated by the truss's solar panels to the operation of the P3/P4 segment. During STS-116, scheduled for December 2006, crewmembers will continue preparing the ISS to support future modules by rewiring the power-generating truss to provide power to the rest of ISS.

NASA also made progress in FY 2006 toward achieving Outcome 2.1 through international collaboration and cooperation. In March 2006, NASA and the Agency's International Partners approved the final ISS configuration at the Heads of Agency meeting held at Kennedy Space Center. This approval allows NASA to finalize the Shuttle launch schedule for ISS assembly. NASA also contracted with the Russian Space Agency for additional cargo and launch services to the ISS via Soyuz/Progress spacecraft at a fixed rate through 2011.

Astronaut Heidemarie Stefanyshyn-Piper, STS-115 mission specialist, works near the ISS's Solar Alpha Rotary Joint during a spacewalk on September 12, 2006. This was the first of three spacewalks to add the new P3/P4 truss. (NASA)

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6ISS1 Green	Reach agreement among the International Partners on the final ISS configuration.	5ISS5 Yellow	4ISS5 Green	None
6ISS3 Yellow	Provide 80 percent of FY 2006 planned on-orbit resources and accommodations to support research, including power, data, crew time, logistics and accommodations.	5ISS4 Yellow	4ISS4 Green	None
6ISS4 Green	For FY 2006 ensure 90 percent functional availability for all ISS subsystems that support on-orbit research operations.	None	None	None

Performance Shortfalls

NASA was unable to meet the original goal of regularly scheduled Shuttle flights throughout FY 2006 due to foam issues on the external tank. While these issues were resolved, NASA did not launch the Shuttle until July 2006—10 months after the start of FY 2006. Shuttle flight delays reduced actual upmass and volume capabilities.

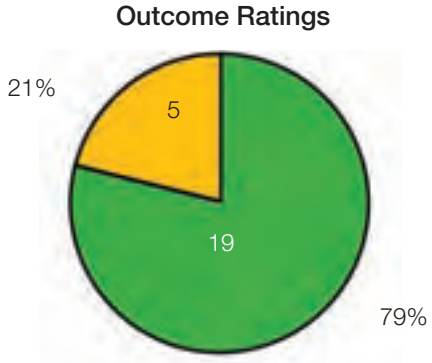
Strategic Goal 3 *Develop a balanced overall program of science, exploration, and aeronautics consistent with the redirection of the human spaceflight program to focus on exploration.*

The Vision for Space Exploration directs NASA to send human explorers to the Moon, Mars, and beyond. Strategic Goal 3 will be enabled by extensive research into human health and performance in space, development of better, smaller, and lighter life support systems, and knowledge of the environments of the Moon, Mars and beyond. The Vision also includes robotic exploration of planetary bodies in the solar system, advanced telescope searches for Earth-like planets around other stars, and the study of the origins, structure, evolution, and destiny of the universe. Additional Presidential and Congressional initiatives guide NASA's study of Earth from space and build on NASA's rich heritage of aeronautics and space science research.

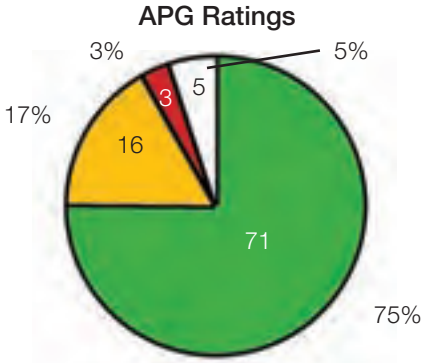
Science enables, and is enabled by, exploration. NASA's access to space makes possible research into scientific questions that are unanswerable on Earth. The International Space Station provides a laboratory to study astronaut health and test life-support technologies in zero gravity over long durations. Space-based telescopes observe the farthest reaches and earliest times in the universe. Robotic spacecraft travel to, land on, rove over, and return samples from bodies throughout the solar system. And, Earth-orbiting satellites keep watch over Earth, making regular observations of global change and enabling better predictions of climate, weather, and natural hazards.

NASA also is the lead government agency for civil aeronautics research, and aeronautics remains a core part of the Agency's Mission. NASA's aeronautics research initiatives will expand the capacity and efficiency of the Nation's air transportation system and contribute to the safety, environmental compatibility, and performance of existing and future air and space vehicles.

NASA's activities under Strategic Goal 3 are broad and varied. These activities are balanced and managed through the six supporting Sub-goals, which focus on individual facets of Strategic Goal 3. The work, achievements, and challenges for each Sub-goal are unique. Therefore, NASA reports performance achievements and challenges for each Sub-goal rather than for the over-arching Strategic Goal 3.



Under Strategic Goal 3, NASA is on track to achieve 19 of 24 Outcomes.



Under Strategic Goal 3, NASA achieved 71 of 95 APGs.

Sub-goal 3A *Study Earth from space to advance scientific understanding and meet societal needs.*

Studying Earth science is in the national interest. NASA's Earth science programs enhance scientists' understanding of the Earth system and its response to natural and human-induced changes—understanding that will lead to improved predictions of climate, weather, and natural hazards. Sub-goal 3A also supports NASA's partnership with other federal agencies pursuing Earth observation initiatives, including the Climate Change Research Initiative, the Global Earth Observation System of Systems, and the U.S. Ocean Action Plan. For example, NASA partners with the National Oceanic and Atmospheric Administration (NOAA), the U.S. Geological Survey (USGS), the Environmental Protection Agency, the Department of Defense, and other government agencies to collect and disseminate Earth science-related information to the American public.

NASA's Earth science missions use satellites, aircraft, and research stations to gather data. The collected data are used in computer models to analyze Earth's water cycle, atmospheric composition, weather patterns, ice flows, and changes in Earth's crust and oceans. NASA and Earth science partners are developing satellites to deliver the first measurements of global sea surface salinity and global carbon-dioxide atmospheric column distributions. Future missions will improve the data record that started with the Earth Observing System (EOS).

Risks to Achieving Sub-goal 3A

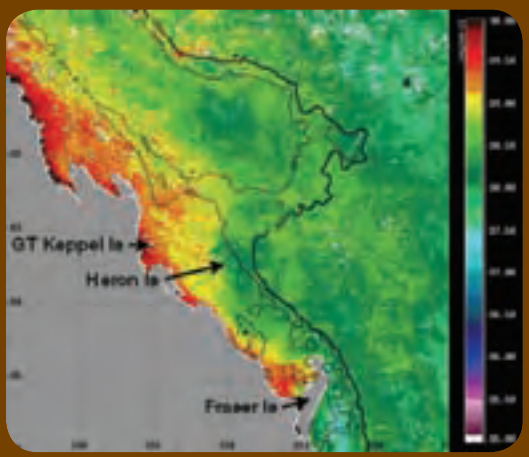
NASA planned to transition some of the observations made by EOS to the National Polar-Orbiting Operational Environment Satellite System (NPOESS), which was designed to integrate the Nation's future military, civil weather, and climate satellite systems. The NPOESS program encountered difficulties, however, leading to a slip in the scheduled launch date and removal of climate instruments from the system. As a result, termination or gaps in several key climate records are a distinct possibility.

An additional risk is associated with the slow pace of development and limited funding (both at NASA and from its domestic and international partners) for the ground-based geodetic observing networks. NASA partnered with other agencies and international partners to establish the Global Geodetic Observing System (GGOS), an international effort to study on a global scale spatial and temporal changes to the shape of Earth, its oceans, ice-covers, and land surfaces. The international partners contribute 50 percent of operating resources. GGOS also supports other applications:

NASA Helps Researchers Diagnose Coral Bleaching

NASA partnered with an international team of scientists to study the fast-acting coral bleaching plaguing Australia's Great Barrier Reef. NASA's Earth-observing satellites are providing the scientists with near-real-time sea surface temperature and ocean color data to give them insight into the impact coral bleaching can have on global ecology. In 2004, NASA scientists developed a free, Internet-based data distribution system that enables researchers around the world to customize data requests, including ocean color and sea-surface temperature data obtained by the Terra and Aqua satellites.

The Great Barrier Reef contains 2,900 reefs, 600 islands, and is a significant source of the world's marine biodiversity. However, these reefs are extremely sensitive to ocean conditions. Warmer waters force coral to expel the tiny algae that provide their color. Ultimately the lack of algae will kill the coral, destroying the reef. NASA's satellite data helps the scientists monitor temperature and color changes in the Great Barrier Reef and surrounding waters, helping protect this important natural resource.



This image of sea-surface temperatures at the southern Great Barrier Reef shows increased temperatures over inshore reefs, the location of the most severe coral bleaching. This image was created from data from NASA's Terra and Aqua satellites. The temperatures are given in Celsius. (Univ. of Queensland)

- The precision navigation and timing for geodetic satellites, including Jason–1 and –2, the Gravity Recovery and Climate Experiment (GRACE), the Ice, Cloud, and Land Elevation satellite (ICESat), and the Constellation Observing System for Meteorology, Ionosphere, and Climate (COSMIC) mission;
- Navigation of interplanetary probes; and
- Alignment of telescopes and communications equipment.

NASA's ability to maintain fully this network to support both scientific research and space operations (which go beyond operations for Earth science missions) is limited. In 2006, NASA closed an important geodetic very-long baseline interferometry observatory in Fairbanks, Alaska, due to budget shortfalls. In previous years, NASA also reduced satellite laser tracking observations by 70 percent. NASA is developing a strategic plan for the development of a next-generation geodetic network to meet the needs of the scientific community. The National Research Council is reviewing the draft strategic plan as part of their decadal survey of Earth sciences and applications from space.

Current U.S. policy commits the federal government to continue collecting Landsat-type data; however, problems with aging spacecraft and delays with follow-on satellites raise concerns about a possible data gap. Launched in April 1999, Landsat–7 will deplete its fuel supply by 2010. A Landsat follow-on mission is scheduled to begin in 2012. NASA is drafting requirements for a "free flying" Landsat data continuity mission, scheduled for competitive bid in FY 2007. NASA also is working proactively with the Agency's international partners to examine other potential sources of land-cover data that can continue the availability of measurements until a Landsat follow-on is operational.

Resources, Facilities, and Major Assets

NASA develops Earth science missions either alone or with partners in the United States and around the world. NASA launches mission satellites, tracks the satellites throughout their missions, and manages data collection, distribution, and archiving. NASA also conducts an active science program that enables the use of NASA-provided data to answer scientific questions, improve predictive capability, and, through interagency partnerships, improve policy and decision-making.

NASA's Earth Observing System Data and Information System (EOSDIS) manages and distributes data products through the Distributed Active Archive Centers. These centers process, archive, document, and distribute data from NASA's past and current research satellites and field programs. Each center serves one or more specific Earth science disciplines and provides data products, data information, services, and tools unique to its particular science. EOSDIS data products are available via the Web.

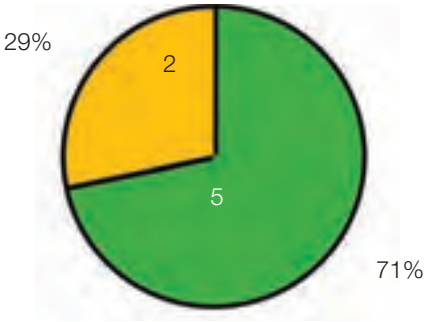
NASA's Ground Communication Networks, which include tracking stations and the Wallops Research Range control and communications, track Earth-orbiting satellites and suborbital vehicles and downlink raw data. The Distributed Active Archive Centers then process the raw data for distribution to users.

The NASA Earth Science Suborbital Science program supports the maintenance and operation of several tailored airborne platforms (including the ER–2, DC–8, WB–57F aircraft) for Earth science research. NASA and the Agency's community of investigators own and operate a broad range of scientific instrumentation, including both in-situ and remote-sensing capabilities, that use these platforms for process study, satellite calibration/validation, and integrated scientific study. In addition, NASA maintains a number of surface-based measurement networks around the world (many in conjunction with international partners) that support satellite calibration and integrated scientific activities. For example, the AERONET network maintains approximately 150 Sun photometers around the world, as well as a data center that receives, processes, and distributes the data from all. In addition, NASA operates critical components of GGOS, including ground-based systems, satellites, and data systems.

To explore the new interdisciplinary field of integrated global Earth system science, NASA uses advanced models that assimilate chemical and physical measurements—initially in the atmosphere and then in the ocean—to simulate the interactions between multiple components of the Earth system. Integrated global Earth system models are an effective tool to determine global carbon sources and sinks, the types of aerosols that increase and decrease global warming, and the important role that clouds play in global climate change.

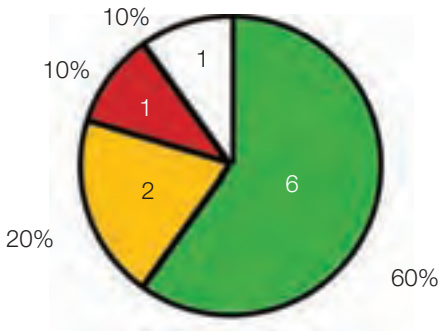
The cost of performance for Sub-goal 3A in FY 2006 was $1,636.36 million.

Outcome Ratings



Under Sub-goal 3A, NASA is on track to achieve 5 of 7 Outcomes.

APG Ratings



Under Sub-goal 3A, NASA achieved 6 of 10 APGs.

Outcome 3A.1: Progress in understanding and improving predictive capability for changes in the ozone layer, climate forcing, and air quality associated with changes in atmospheric composition.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

Over 99.9 percent of Earth's atmosphere is a mixture of nitrogen, oxygen, and argon. Trace gases and aerosols, including pollutants from human activities, make up the remaining one-tenth percent. These gases play a critical role in atmospheric chemistry and contribute to regional and global climate changes. In FY 2006, NASA participated in and provided leadership for the Intercontinental Chemical Transport Experiment (INTEX–B), a comprehensive field campaign to study atmospheric pollutants and trace gases. INTEX–B traced the movement and evolution of pollutant gases and particles between and across continents to assess their impact on regional air quality and climate. NASA researchers coordinated observations from ground-based sites, aircraft, and NASA satellites, including Aura, Aqua, and Terra, to provide a complete picture of pollutant transport to and from the United States and to validate improved predictive capabilities for understanding changes in atmospheric composition. NASA also integrated INTEX–B findings with the National Science Foundation's Megacity Initiative: Local and Global Research Observations (MILAGRO) campaign to study air quality in the Mexico City region, as well as surrounding areas affected by the megacity's air quality.

The Cloud Absorption Radiometer (CAR) instrument is installed in the nose of a Jetstream–31 aircraft for INTEX–B. Developed at the Goddard Space Flight Center, CAR acquires imagery of cloud and Earth surface features and determines the single-scattering albedo (the reflective power) of clouds. (NASA)

In the upper portions of the atmosphere, ozone protects Earth from ultraviolet radiation. When ozone is generated near Earth's surface, however, it can be harmful to crops and human health. Ozone also acts as a greenhouse gas that can lead to climate change in specific regions. In FY 2006, scientists used the NASA Goddard Institute for Space Studies (GISS) chemistry model to trace ozone and its role in regional warming when present in Earth's upper troposphere. According to GISS findings, ozone is transported efficiently to the Arctic during fall, winter, and spring, contributing significantly to warming during these months. During the summer months, sunshine destroys the ozone before it can be transported, so regional warming occurs only over the sight of pollution.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6ESS1 Green	For current observations, reduce the cost of acquiring and distributing the data stream to facilitate adoption by the operational community.	None	None	None
6ESS3 Green	Keep 90 percent of the total on-orbit instrument complement functional throughout the year.	None	None	None
6ESS4 Green	Mature two to three technologies to the point they can be demonstrated in space or in an operational environment and annually advance 25 percent of funded technology developments one Technology Readiness Level (TRL).	None	None	None
6ESS5 Green	Increase the number of distinct users of NASA data and services.	None	None	None
6ESS6 Yellow	Improve level of customer satisfaction as measured by a baselined index obtained through the use of annual surveys.	None	None	None
6ESS7 Green	Demonstrate progress that NASA-developed data sets, technologies and models enhance understanding of the Earth system leading to improved predictive capability in each of the six science focus area roadmaps. Progress toward achieving outcomes will be validated by external review.	None	None	None
6ESS20 Green	Systematically continue to transfer research results from spacecraft, instruments, data protocols, and models to NOAA and other operational agencies as appropriate.	None	None	None

Performance Shortfalls

6ESS6: The FY 2006 EOSDIS customer satisfaction survey produced a score of 74, a decrease from the very-high score of 78 in 2005. This score is still above the federal government average of 71.

Outcome 3A.2: Progress in enabling improved predictive capability for weather and extreme weather events.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

NASA provides expertise, satellites, and infrastructure to develop new and improved weather forecasting capabilities for operational agencies, such as the Navy and NOAA, to issue forecasts to protect life, property, and the Nation's vital interests. Many of NASA's Earth-observation research satellites, such as the CloudSat and the Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) satellites launched in April 2006, provide unprecedented views of Earth and enable scientists to study phenomena with greater scope, detail, and precision than ever before. For example, from these two missions, scientists can study the three-dimensional distribution of clouds and aerosols, enabling them to track the height of aerosol plumes around the globe. They also help scientists look at the properties of multi-layered clouds and better assess their impact on climate.

Scientists at NASA's Goddard Space Flight Center and the University of Maryland at Baltimore County used observations of cloud tops from the Tropical Rainfall Measuring Mission (TRMM) satellite to improve computer model forecasts of hurricane winds to better estimate whether a hurricane's surface winds will strengthen or weaken. This new capability has benefits for hazard mitigation and the potential to save lives and reduce property damage associated with major hurricanes.

NASA also flew the DC–8 research aircraft off the coast of West Africa as part of the Agency's contribution to the African Monsoon Multidisciplinary Analyses during summer 2006. The DC–8, outfitted as a "virtual satellite," provided the most comprehensive sampling of westward-moving waves flowing off the coast of Africa, helping to answer important but poorly understood question of how and why some of these turn into hurricanes, while others do not. The combination of in-situ and remote-sensing instruments aboard the aircraft, together with data from NASA satellites such as Terra, Aqua, Aura, CALIPSO, and CloudSat, should provide a wealth of data that can be used for scientific study over the next few years.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6ESS1 Green	For current observations, reduce the cost of acquiring and distributing the data stream to facilitate adoption by the operational community.	None	None	None
6ESS3 Green	Keep 90 percent of the total on-orbit instrument complement functional throughout the year.	None	None	None
6ESS4 Green	Mature two to three technologies to the point they can be demonstrated in space or in an operational environment and annually advance 25 percent of funded technology developments one Technology Readiness Level (TRL).	None	None	None
6ESS5 Green	Increase the number of distinct users of NASA data and services.	None	None	None
6ESS6 Yellow	Improve level of customer satisfaction as measured by a baselined index obtained through the use of annual surveys.	None	None	None
6ESS7 Green	Demonstrate progress that NASA-developed data sets, technologies and models enhance understanding of the Earth system leading to improved predictive capability in each of the six science focus area roadmaps. Progress toward achieving outcomes will be validated by external review.	None	None	None
6ESS20 Green	Systematically continue to transfer research results from spacecraft, instruments, data protocols, and models to NOAA and other operational agencies as appropriate.	None	None	None

Performance Shortfalls

6ESS6: See Outcome 3A.1, above.

Outcome 3A.3: Progress in quantifying global land cover change and terrestrial and marine productivity, and in improving carbon cycle and ecosystem models.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

NASA-funded scientists at the University of California, Berkeley, using an integrated global Earth system model, discovered that increased global warming over the next century will diminish the ocean's capacity to store carbon dioxide. This eventually will lead to increased levels of carbon dioxide from human activities in the atmosphere, further amplifying global warming. NASA's Orbiting Carbon Observatory (OCO) will be a key tool in characterizing the global distributions of carbon dioxide, and should enable scientists to determine its sources and sinks, yielding better understanding of the processes that control atmospheric carbon dioxide. In FY 2006, researchers completed several system reviews of the OCO spacecraft in preparation for its 2008 launch.

NASA and USGS have worked together on the Landsat program—an environmental remote sensing satellite program—since 1972 to collect and analyze data on land-cover change and use. This year, NASA-funded researchers used Landsat imagery and U.S. Census population data from 1973 to 2000 to examine for the first time the relationship between land-cover and land-use changes in the United States. Researchers learned that as of 2000, the area of exurban development (areas with housing density between one dwelling per acre and one dwelling per 40 acres) occupied nearly 15 times the area of urbanized development (areas with a housing density greater than one housing unit per acre). Exurban areas now cover 25 percent of the 48 contiguous states. Within the Mid-Atlantic and Southeastern regions, the Appalachian eco-region showed the slowest rate of land cover change. Exurban growth throughout the United States will impact future urban planning and environmental monitoring.

NASA also is assessing options for maintaining the availability of Landsat-type land-cover measurements (see "Risks to Achieving Sub-goal 3A," above, for more information).

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6ESS1 Green	For current observations, reduce the cost of acquiring and distributing the data stream to facilitate adoption by the operational community.	None	None	None
6ESS3 Green	Keep 90 percent of the total on-orbit instrument complement functional throughout the year.	None	None	None
6ESS4 Green	Mature two to three technologies to the point they can be demonstrated in space or in an operational environment and annually advance 25 percent of funded technology developments one Technology Readiness Level (TRL).	None	None	None
6ESS5 Green	Increase the number of distinct users of NASA data and services.	None	None	None
6ESS6 Yellow	Improve level of customer satisfaction as measured by a baselined index obtained through the use of annual surveys.	None	None	None
6ESS7 Green	Demonstrate progress that NASA-developed data sets, technologies and models enhance understanding of the Earth system leading to improved predictive capability in each of the six science focus area roadmaps. Progress toward achieving outcomes will be validated by external review.	None	None	None
6ESS20 Green	Systematically continue to transfer research results from spacecraft, instruments, data protocols, and models to NOAA and other operational agencies as appropriate.	None	None	None

Performance Shortfalls

6ESS6: See Outcome 3A.1, above.

Outcome 3A.4: Progress in quantifying the key reservoirs and fluxes in the global water cycle and in improving models of water cycle change and fresh water availability.

FY 2006	FY 2005	FY 2004	FY 2003
Yellow	None	None	None

NASA launched the CloudSat satellite in April 2006. As expected, CloudSat is able to characterize all major cloud system types, and its radar is able to penetrate all but the heaviest rainfall, enabling simultaneous imaging of storm clouds and precipitation.

During FY 2006, the Tropospheric Emission Spectrometer aboard NASA's Aura satellite yielded breakthrough observations that helped identify the primary processes and sources controlling the global water cycle in the atmosphere. By comparing the relative concentrations of different isotopic types of water vapor, scientists determined the extent of regional re-evaporation, a process where rainfall evaporates and is recycled back into clouds. The observations revealed that in tropical regions, up to 70 percent of precipitation is re-evaporated into clouds, proving that the re-evaporation process is a major component of cloud formation and energy transport.

Greenland hosts the largest reservoir of fresh water in the northern hemisphere. Any substantial changes in the mass of its ice sheet will affect global sea levels, ocean circulation, and Earth's climate system. Using data from GRACE—a mission with the unique ability to measure monthly mass changes for an entire ice sheet—NASA scientists measured a decrease in the mass of the Greenland ice cap due to melting. GRACE also detected that the thinning rate of Greenland's ice sheet (approximately 39 cubic miles a year between 2002 and 2005) is higher than previously published estimates.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6ESS1 Green	For current observations, reduce the cost of acquiring and distributing the data stream to facilitate adoption by the operational community.	None	None	None
6ESS3 Green	Keep 90 percent of the total on-orbit instrument complement functional throughout the year.	None	None	None
6ESS4 Green	Mature two to three technologies to the point they can be demonstrated in space or in an operational environment and annually advance 25 percent of funded technology developments one Technology Readiness Level (TRL).	None	None	None
6ESS5 Green	Increase the number of distinct users of NASA data and services.	None	None	None
6ESS6 Yellow	Improve level of customer satisfaction as measured by a baselined index obtained through the use of annual surveys.	None	None	None
6ESS7 Green	Demonstrate progress that NASA-developed data sets, technologies and models enhance understanding of the Earth system leading to improved predictive capability in each of the six science focus area roadmaps. Progress toward achieving outcomes will be validated by external review.	None	None	None
6ESS20 Green	Systematically continue to transfer research results from spacecraft, instruments, data protocols, and models to NOAA and other operational agencies as appropriate.	None	None	None
6ESS22 White	Complete Global Precipitation Measurement (GPM) Confirmation Review.	None	None	None

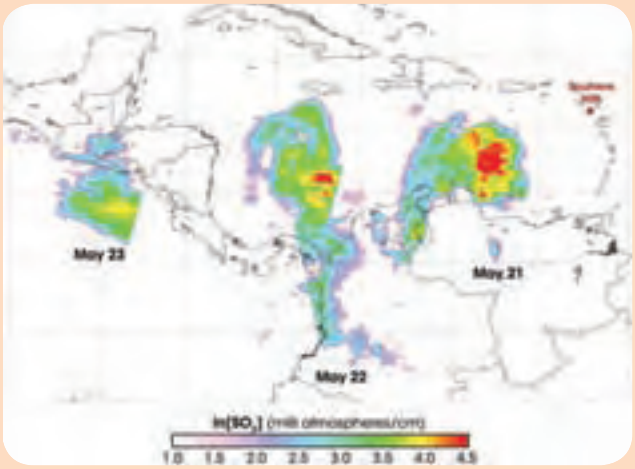
Performance Shortfalls

Outcome 3A.4: Research results in 2006 enabled progress in understanding and modeling the water cycle. However, delays in the development and launch of the Global Precipitation Measurement (GPM) mission and the NPOESS Preparatory Project (NPP) will impact NASA's progress in this science focus area.

6ESS6: See Outcome 3A.1 above.

6ESS22: NASA management deferred the GPM mission. NASA will develop an Earth science roadmap based on the mission priorities established in the decadal survey expected from the National Research Council in December 2006. The Agency will use the roadmap to re-baseline the support available to GPM by the spring of 2007.

The May 20, 2006, eruption of Soufriere Hills Volcano on Montserrat sent a cloud of ash and volcanic gas nearly 17 kilometers (55,000 feet) into the atmosphere. Intermingled with the volcanic plume was a high concentration of sulfur dioxide, measured by the AIRS instrument on Aqua. Once in the atmosphere, chemical reactions (oxidation) turn sulfur dioxide into sulfate aerosol particles that create a bright haze that reflects sunlight back into space. Since less sunlight reaches the Earth, the sulfate aerosols have a cooling effect on the climate. The effect is typically regional, but if enough of the gas reaches high into the stratosphere, the part of the atmosphere that is 20 to 50 kilometers above the surface of the Earth, temperatures around the world can drop. NASA built AIRS to help scientists gain a better understanding of weather and climate, including how gases like sulfur dioxide and the aerosols they produce impact temperatures and weather patterns. (F. Prata, Norwegian Inst. for Air Research)



Outcome 3A.5: Progress in understanding the role of oceans, atmosphere, and ice in the climate system and in improving predictive capability for its future evolution.

FY 2006	FY 2005	FY 2004	FY 2003
Yellow	None	None	None

NASA funds research and satellite observations to study the dynamics between the oceans, atmosphere, and ice reservoirs. Studying the relationship of these systems improves predictions of future climate activity and increases understanding of climate processes. In FY 2006, observations from NASA's Aura satellite showed that when a sea surface temperature exceeds about 80 degrees Fahrenheit, water evaporated from the warm surface is carried to the upper atmosphere through the formation of towering cumulus clouds (or thunderheads). This warm water vapor eventually evaporates ice particles in the high-altitude clouds, leaving increased water vapor concentrations in the upper atmosphere. This finding indicates that the cloud-induced moistening of the tropical upper troposphere leads to about three times more water vapor output than is expected in the absence of the clouds.

Scientists at NASA's Jet Propulsion Laboratory used satellite observations to measure the complete cycle of atmospheric water movement over the South American continent, ocean to ocean. Using data from NASA's QuikScat, GRACE, and TRMM satellites, researchers confirmed that the amount of atmospheric water flowing into the continent as rain and snow was equal to the amount of water returned to the ocean by rivers. This finding represents the first direct observations of the seasonal cycle of continental water balance.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6ESS1 Green	For current observations, reduce the cost of acquiring and distributing the data stream to facilitate adoption by the operational community.	None	None	None
6ESS3 Green	Keep 90 percent of the total on-orbit instrument complement functional throughout the year.	None	None	None
6ESS4 Green	Mature two to three technologies to the point they can be demonstrated in space or in an operational environment and annually advance 25 percent of funded technology developments one Technology Readiness Level (TRL).	None	None	None
6ESS5 Green	Increase the number of distinct users of NASA data and services.	None	None	None
6ESS6 Yellow	Improve level of customer satisfaction as measured by a baselined index obtained through the use of annual surveys.	None	None	None
6ESS7 Green	Demonstrate progress that NASA-developed data sets, technologies and models enhance understanding of the Earth system leading to improved predictive capability in each of the six science focus area roadmaps. Progress toward achieving outcomes will be validated by external review.	None	None	None
6ESS20 Green	Systematically continue to transfer research results from spacecraft, instruments, data protocols, and models to NOAA and other operational agencies as appropriate.	None	None	None
6ESS23 Red	Complete Operational Readiness Review for the NPOESS Preparatory Project (NPP).	None	None	None

Performance Shortfalls

Outcome 3A.5: Cost overruns and technical difficulties delayed the NPOESS Preparatory Project (NPP) mission, which will impact NASA's progress in this science focus area. Program funding supports the NPP 2009 launch date.

6ESS6: See Outcome 3A.1 above.

6ESS23: Due to late delivery of the key Visible/Infrarerd Imager/Radiometer Suite (VIIRS) instrument from a program partner, NASA moved the Operational Readiness Review for NPP to September 2009.

Outcome 3A.6: Progress in characterizing and understanding Earth surface changes and variability of Earth's gravitational and magnetic fields.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

The measurements of changes in the gravity field over time from the GRACE mission yielded the first uniform mass balance estimates for the Greenland and Antarctic polar ice caps, indicating significant and perhaps accelerating loss of ice mass. During FY 2006, the GRACE mission also yielded other results:

- Circum-Antarctic deep-ocean current variability;
- Regional water accumulation data demonstrating that algorithms show continual improvement for estimating biweekly to multi-year trends and periodicities in water storage over land regions, from continental areas to regional drainage basins;
- The first complete signature of land surface displacements due to a major earthquake; and
- Observations showing that the movement of the ocean floor resulting from the Aceh Earthquake of December 2004 caused a gravity change on Earth. This is the first observation of the stretching within Earth's crust caused by an undersea earthquake. The finding indicates that GRACE's measurements will provide a new global capability to enhance understanding of the release of stress by large earthquakes.

NASA continues to support the measurement of Earth's magnetic field variability. For example, the European Space Agency's satellite constellation, Swarm (to be launched in 2009), uses a NASA-developed, comprehensive model for geomagnetic modeling. NASA also supports the measurement of ultra-low-frequency electromagnetic signals in California to study possible earthquake precursors.

In July 2006, NASA announced progress in understanding earthquake causes and effects with the development of a rapid earthquake-magnitude evaluation technique that reduces the time needed to determine the magnitude of large earthquakes from hours to minutes. The system is crucial to identifying possible tsunami-producing earthquakes, enabling early activation of disaster response teams. The system builds on the NASA-developed, real-time GPS precision positioning capability, which can feed data into the real-time tsunami modeling system being developed by NOAA. The USGS also has expressed interest in working with NASA to develop a similar capability to augment its seismometer-based networks. The real-time GPS capability also could be deployed aboard ocean buoys to aid in detecting passing tsunamis.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6ESS1 Green	For current observations, reduce the cost of acquiring and distributing the data stream to facilitate adoption by the operational community.	None	None	None
6ESS3 Green	Keep 90 percent of the total on-orbit instrument complement functional throughout the year.	None	None	None
6ESS4 Green	Mature two to three technologies to the point they can be demonstrated in space or in an operational environment and annually advance 25 percent of funded technology developments one Technology Readiness Level (TRL).	None	None	None
6ESS5 Green	Increase the number of distinct users of NASA data and services.	None	None	None
6ESS6 Yellow	Improve level of customer satisfaction as measured by a baselined index obtained through the use of annual surveys.	None	None	None
6ESS7 Green	Demonstrate progress that NASA-developed data sets, technologies and models enhance understanding of the Earth system leading to improved predictive capability in each of the six science focus area roadmaps. Progress toward achieving outcomes will be validated by external review.	None	None	None

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6ESS20 Green	Systematically continue to transfer research results from spacecraft, instruments, data protocols, and models to NOAA and other operational agencies as appropriate.	None	None	None

Performance Shortfalls

6ESS6: See Outcome 3A.1, above.

Outcome 3A.7: Progress in expanding and accelerating the realization of societal benefits from Earth system science.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

NASA's Applied Science Program collaborates with other federal agency partners to expand their use of NASA Earth science research results. The Applied Science Program activities provide innovative benefits to the Nation in 12 focus areas: Agricultural Efficiency, Air Quality, Aviation, Carbon Management, Coastal Management, Disaster Management, Ecological Forecasting, Energy Management, Homeland Security, Invasive Species, Public Health, and Water Management. In FY 2006, the program made progress toward this Outcome through 147 funded activities that yielded results in all 12 focus areas. One project included an evaluation of the NOAA Harmful Algal Blooms Observation System prototype, which will alert coastal management officials when populations of phytoplankton (i.e., harmful algal blooms) grow out of control, threaten coastal ecosystems, or pose hazards to human health. The program also validated a prototype system that integrates NASA Earth science results into the Center for Disease Control (CDC)-sponsored ArboNET/Plague Surveillance System. This CDC system tracks insect populations that carry and transmit disease-producing microorganisms. NASA data and infrastructure support through the Regional Visualization and Monitoring System (SERVIR) Program also improved ecological forecasting and disaster management in Central America. NASA research enhanced aviation weather-hazard nowcasting (forecasting in a zero- to six-hour timeframe) and improved short-term forecasting products developed by the Federal Aviation Administration. NASA's research also improved global crop monitoring performed by the U.S. Department of Agriculture.

The National Research Council is evaluating NASA's progress toward this Outcome.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6ESS1 Green	For current observations, reduce the cost of acquiring and distributing the data stream to facilitate adoption by the operational community.	None	None	None
6ESS21 Yellow	Benchmark the assimilation of observations and products in decision support systems serving applications of national priority. Progress will be evaluated by the Committee on Environmental and National Resources.	None	None	None

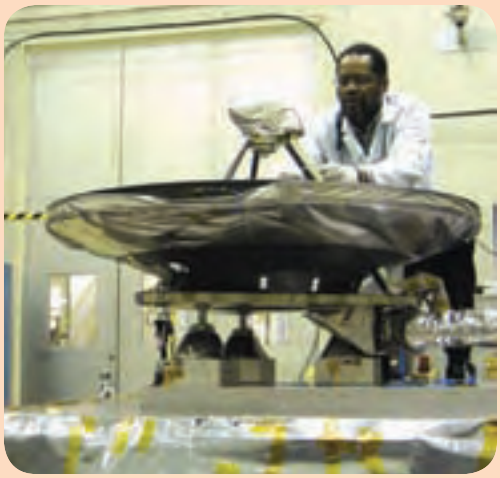
Performance Shortfalls

6ESS21: NASA completed this benchmarking in support of such areas as agricultural efficiency, air quality, aviation, disaster management, and public health. However, the external evaluation was postponed, primarily due to delays related to committee members' schedules.

Sub-goal 3B *Understand the Sun and its effects on Earth and the solar system.*

Life on Earth is linked to the behavior of the Sun. The Sun's energy output is fairly constant when averaged over thousands of years, yet highly variable on an 11-year cycle. Moreover, short-term events like solar flares and coronal mass ejections (CMEs) can change drastically solar emissions over the course of a single second. All of the solar system's planets orbit within the outer layers of the Sun's atmosphere, and some planetary bodies, like Earth, have an atmosphere and magnetic field that interacts with solar wind. While Earth's magnetic field protects life, it also acts as a battery, storing energy from solar wind until it is released, producing "space weather" that can disrupt communications, navigation, and power grids, damage satellites, and threaten the health of astronauts.

NASA researchers study the Sun and its influence on the solar system as elements of a single, interconnected Sun–Earth system using a group of satellites that form the Heliophysics Great Observatory. NASA seeks to understand the fundamental physics behind Sun–planet interactions and use this information to protect humans and electronics in space and on Earth. NASA also studies specific space environmental hazards to help the Agency design, build, and operate safe and stable exploration spacecraft.



A technician readies a high-gain antenna for vibration testing at the Johns Hopkins University Applied Physics Laboratory in Laurel, Maryland, in late 2005. This antenna later was attached to the STEREO "A" observatory at the Goddard Space Flight Center. NASA will launch STEREO in early FY 2007. (NASA/JHU–APL)

Risks to Achieving Strategic Sub-goal 3B

Most of the missions that make up the multi-national Heliophysics Great Observatory, including the Solar and Heliospheric Observatory (SOHO), Voyagers 1 and 2, and the Fast Auroral Snapshot Explorer (FAST), are past their initial design life and starting to show signs of age. Some satellites already have fallen victim to age. For example, the Imager for Magnetopause-to-Aurora Global Exploration (IMAGE), which was designed for a two-year mission, failed in FY 2006 after almost six years of successful operation. By operating this group of spacecraft as a single observational system, researchers can collect data for a variety of models to fill observational gaps and provide predictions of tomorrow's space weather. NASA plans to launch new missions in FY 2007 to refresh the Heliophysics Great Observatory: the Solar Terrestrial Relations Observatory (STEREO), the Aeronomy of Ice in the Mesosphere (AIM), and the Time History of Events and Macroscale Interactions (THEMIS) mission. The joint NASA–Japanese Aerospace Exploration Agency Solar–B mission, now called Hinode (or "sunrise" in Japanese), launched from Japan on September 22, 2006. However, NASA's ability to launch future small, less-expensive missions is threatened by the rising cost of smaller launch vehicles and escalating development costs. An inability to sustain new heliophysics missions could create capability gaps for the Heliophysics Great Observatory.

Resources, Facilities, and Major Assets

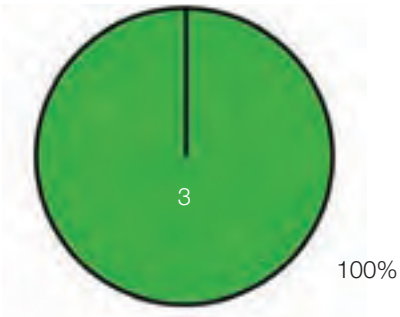
NASA's fleet of operational satellites, as well as missions currently in development, are the greatest assets contributing to the successful achievement of Sub-goal 3B. These satellites represent considerable investments in time, money, and workforce skills by NASA and partners across the country and around the world.

NASA's Heliophysics Data Environment—a standardized, electronic tool to collect, store, manage, and distribute Sun–Earth mission data—harnesses the full benefit of heliophysics science conducted by NASA and program partners. The project uses Virtual Observatories that link together the world's science community and available astronomy and astrophysics data using computer technology. In FY 2006, NASA added five new Virtual Observatories to the Heliophysics Data Environment.

All NASA space science data is archived permanently by the National Space Science Data Center (NSSDC), located at the Goddard Space Flight Center. NSSDC's Space Physics Data Facility hosts an archive that consists of Web-based services for survey and high-resolution data, trajectories, and modeling software. The facility delivers value-added services and leads in the definition, development, operation, and promotion of collaborative projects.

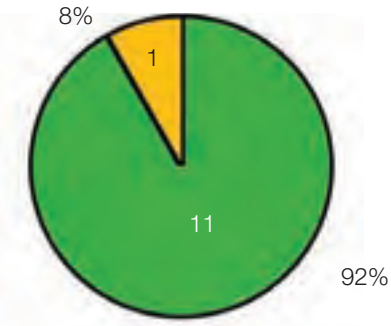
The cost of performance for Sub-goal 3B in FY 2006 was $974.71 million.

Outcome Ratings



Under Sub-goal 3B, NASA is on track to achieve all 3 Outcomes.

APG Ratings



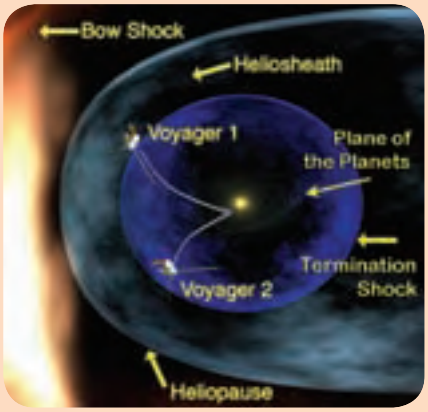
Under Sub-goal 3B, NASA achieved 11 of 12 APGs.

Outcome 3B.1: Progress in understanding the fundamental physical processes of the space environment from the Sun to Earth, to other planets, and beyond to the interstellar medium.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

Understanding how space weather originates and evolves is the first step toward predicting space weather events that pose a potential threat to Earth and space explorers. In FY 2006, NASA researchers identified sources of solar energetic particles, observed variations in the thickness of the Sun's atmosphere in connection with the 11-year solar cycle, and found evidence that solar flare-accelerated ions and electrons may originate from separate locations.

Most of the planets in the solar system orbit along a similar plane, almost like they were sitting on a table around the Sun. As the two Voyager spacecraft journeyed beyond the planets, Voyager 1 flew "north" (above the plane) and Voyager 2 flew "south" (below the plane), as shown in this illustration. During FY 2006, Voyager 2 discovered that the termination shock (shown in bright blue) is 840 million miles closer to the Sun in the south than observed by Voyager 1 in the north. As a result, Voyager 2 will cross the termination shock a year earlier than expected. Voyager 1 crossed the termination shock in FY 2005. (NASA)



Below the plane of the planets, the Voyager 2 spacecraft observed evidence of the solar system's termination shock—the shock wave that forms as solar wind reaches the boundary between the edge of the solar system and interstellar space—at a distance of about 840 million miles closer to the Sun than observed by Voyager 1 in the north. This difference shows a distortion in the shape of the heliosphere—the giant magnetic bubble containing the solar system—likely resulting from an inclined interstellar magnetic field pressing inward on the heliosphere from the south. The compressed shape of the heliosphere in the south means that Voyager 2 probably will cross the

termination shock a year ahead of expectations, joining Voyager 1 in exploring the heliosheath, the final frontier of the solar system.

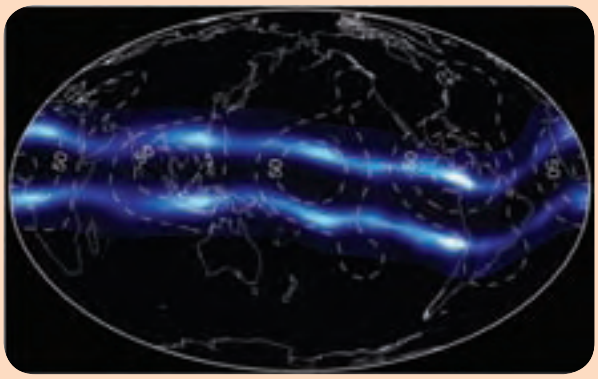
FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6ESS11 Green	Successfully demonstrate progress in understanding the structure and dynamics of the Sun and solar wind and the origins of solar variability. Progress toward achieving outcomes will be validated by external expert review.	5SEC9 Blue	4SEC11 Green	3S7 Green
6ESS12 Green	Successfully demonstrate progress in determining the evolution of the heliosphere and its interaction with the galaxy. Progress in achieving outcomes will be validated by external expert review.	None	None	None
6ESS14 Green	Successfully demonstrate progress in discovering how magnetic fields are created and evolve and how charged particles are accelerated. Progress in achieving outcomes will be validated by external expert review.	5SEC12 Blue	4SEC14 Green	None
6ESS15 Green	Successfully demonstrate progress in understanding coupling across multiple scale lengths and its generality in plasma systems. Progress in achieving outcomes will be validated by external expert review.	5SEC13 Green	4SEC15 Green	None
6ESS17 Green	Complete the Solar Dynamics Observatory (SDO) spacecraft structure and begin Integration and Test (I&T).	5SEC2 Green	None	None
6ESS18 Green	Initiate Geospace Phase A studies.	White	None	None

Outcome 3B.2: Progress in understanding how human society, technological systems, and the habitability of planets are affected by solar variability and planetary magnetic fields.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

In FY 2006, NASA advanced the understanding of both short- and long-term variations in solar emissions. This is important progress because these emissions can increase densities in Earth's ionosphere and produce magnetic storms within Earth's magnetosphere that occasionally disable satellites, power grids, and other critical technologies. In FY 2006, NASA developed a new model that allows researchers to fly virtual satellites through simulations of Earth's Van Allen Belts, radiation belts of high-energy particles (mainly protons and electrons) held captive by the magnetic influence of Earth. The model shows how high-energy particles trapped in the belts would affect optical and thermal coatings as the virtual satellite orbits through a selected region. The results will help NASA select coatings based on a satellite's planned orbit, giving satellites additional protection from the effects of destructive high-energy particles throughout its mission.

NASA has shown that the impact of the Sun on space weather around Earth is different for dense clouds of solar material than for long high-speed streams of gas. Space storms triggered by magnetic clouds tend to be brief, and produce new, transient radiation belts, great auroras, and disruptive ground currents. Space storms triggered by high-speed streams are longer in duration, more likely to



During FY 2006, weather on Earth was found to have a surprising connection to space weather in the electrically charged upper atmosphere, or ionosphere. This discovery will help improve forecasts of turbulence in the ionosphere, which can disrupt radio signals from satellites including communications satellites and the Global Positioning System. Using pictures from IMAGE, the team discovered four mysteriously bright regions in the Appleton Anomalies that were 20 to 30 percent denser than average. Three of these bright zones were located over tropical rainforests with lots of storm activity: the Amazon Basin in South America, the Congo Basin in Africa, and Indonesia. A fourth region appeared over the Pacific Ocean. Researchers confirmed that thunderstorms over the three tropical rainforest regions produce rising tides of hot air that were altering the structure of the ionosphere. (NASA)

affect spacecraft, and produce more intense radiation belts. Studies of these differences are important to understanding the effects of solar events on the Earth system.

The charged particles (or plasma) trapped in the Van Allen Belts are drained continuously and replenished through dynamic interactions between the Sun and Earth. This interaction can alter the size and intensity of the radiation belts, creating space weather that affects directly the performance of satellites. NASA has discovered how one of these processes replenishes the high-energy radiation in the belts. NASA research revealed how low-frequency electromagnetic waves quickly accelerate plasma in the radiation belts. These waves, which are common in the boundary between the radiation belts and the cold, dense plasma from the upper ionosphere, are a primary source for replenishing the radiation belts.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6ESS8 Green	Successfully demonstrate progress in developing the capability to predict solar activity and the evolution of solar disturbances as they propagate in the heliosphere and affect the Earth. Progress toward achieving outcomes will be validated by external expert review.	5SEC6 Green	4SEC8 Green	3S7 Green
6ESS9 Green	Successfully demonstrate progress in specifying and enabling prediction of changes to the Earth's radiation environment, ionosphere, and upper atmosphere. Progress toward achieving outcomes will be validated by external expert review.	5SEC7 Green	4SEC9 Green	3S8 Green
6ESS10 Green	Successfully demonstrate progress in understanding the role of solar variability in driving space climate and global change in the Earth's atmosphere. Progress toward achieving outcomes will be validated by external expert review.	5SEC8 Green	4SEC10 Blue	None
6ESS13 Green	Successfully demonstrate progress in understanding the response of magneto-spheres and atmospheres to external and internal drivers. Progress in achieving outcomes will be validated by external expert review.	5SEC11 Green	4SEC13 Green	None
6ESS16 Yellow	Successfully launch the Solar Terrestrial Relations Observatory (STEREO).	5SEC1 Yellow	None	None
6ESS17 Green	Complete the Solar Dynamics Observatory (SDO) spacecraft structure and begin Integration and Test (I&T).	5SEC2 Green	None	None
6ESS18 Green	Initiate Geospace Phase A studies.	5SEC4 White	None	None
6ESS19 Green	Publish Solar Sentinels Science Definition Team report.	None	None	None

Performance Shortfalls

6ESS16: NASA postponed the STEREO mission launch due to problems with the Delta II launch vehicle second-stage tanks.

Outcome 3B.3: Progress in developing the capability to predict the extreme and dynamic conditions in space in order to maximize the safety and productivity of human and robotic explorers.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

To safeguard astronauts and robotic assets in space, researchers must characterize the extremes and variability of solar-induced events. The SOHO team made progress toward predicting potentially harmful solar events during FY 2006 by watching for wave motions excited in the Sun's interior that are indicative of areas of high activity. This new method allows scientists to see almost the entire far side of the Sun. Since the Sun rotates every 27 days relative to Earth, a solar flare could erupt around the horizon at any time. This new method for monitoring the entire surface of the Sun will provide early warning of solar events, helping NASA protect astronauts in space.

Scientists supporting NASA's Living with a Star Program created a new model of the Sun's dynamo, which described the peaks of the last eight solar cycles, that has promise for predicting future solar-cycle activity. If successful, this model will allow NASA to plan for future high-activity cycles and protect human and robotic explorers. NASA also developed a simulation of the slowly evolving solar corona that can predict conditions that could produce CMEs. CMEs occur when a magnetic field under stress snaps, releasing billions of pounds of accelerated plasma, charged particles that can damage electronics and harm unprotected astronauts. In March 2006, NASA testing showed that the model could successfully predict the structure and appearance of the corona during a total solar eclipse.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6ESS16 Yellow	Successfully launch the Solar Terrestrial Relations Observatory (STEREO).	5SEC1 Yellow	None	None
6ESS17 Green	Complete the Solar Dynamics Observatory (SDO) spacecraft structure and begin Integration and Test (I&T).	5SEC2 Green	None	None
6ESS18 Green	Initiate Geospace Phase A studies.	5SEC4 White	None	None
6ESS19 Green	Publish Solar Sentinels Science Definition Team report.	None	None	None

Performance Shortfalls

6ESS16: See Outcome 3B.2 above.

NASA's ST-5 Satellites Push Technological Boundaries

In FY 2006, NASA tested an innovative technology for micro-satellites that operate as a group. Space Technology 5 (ST5), a group of three spacecraft, was launched from a modified Pegasus XL rocket on March 22, 2006. Each satellite weighed about 55 pounds and was the size of a birthday cake. After launching, the micro-satellites positioned themselves in a "string of pearls" constellation, approximately 25 to 90 miles apart.

Despite their small size, these satellites came fully loaded and carried a scientific payload that mapped the intensity and direction of magnetic fields within the inner magnetosphere. The main goal of the mission was to demonstrate the benefits of a group of small, low-cost spacecraft taking measurements at the same time in different locations. ST5 helped NASA learn how to build efficiently identical micro-satellites, shortening development time and lowering costs for future micro-satellite missions. ST5 stopped operations on June 30, 2006, after a successful 90-day mission.

Engineers build one of three ST5 micro-satellites at the Goddard Space Flight Center. NASA then shipped the micro-satellites to Vandenberg Air Force Base, California, for testing and launch. (NASA)

Sub-goal 3C *Advance scientific knowledge of the solar system, search for evidence of life, and prepare for human exploration.*

NASA's robotic science missions are paving the way for human space exploration by studying and characterizing alien environments, identifying possible resources, validating new capabilities, and delivering the infrastructure that will enable safe and effective human missions.

Robotic explorers also gather data to help scientists understand how the planets formed, what triggered different evolutionary paths among planets, and how Earth originated, evolved, and became habitable. To search for evidence of life beyond Earth, scientists use this data to map zones of habitability, study the chemistry of alien worlds, and unveil the processes that lead to conditions necessary for life. Moreover, NASA scientists gain knowledge from robotic exploration that provides valuable insight into the nature of life on Earth.

Knowledge about the solar system helps protect life on Earth. For example, through the Near Earth Object Observation Program, NASA identifies and categorizes near-Earth objects (e.g., asteroids and comets) that could threaten life on Earth.

Risks to Achieving Sub-goal 3C

Interplanetary spacecraft for solar system exploration are expensive and complex and often require long lead-times for planning and development. Once launched, the travel times to the spacecraft's destinations may take months or years.

Assessments

In FY 2006, the Office of Management and Budget (OMB) assessed the Solar System Exploration Theme with OMB's Program Assessment Rating Tool (PART). OMB assessed the overall program as "Effective," the highest rating available, with the following scores by rating area:

- Program Purpose and Design—100%
- Strategic Planning—100%
- Program Management—91%
- Program Results/Accountability—80%

The lower scores under Program Management and Program Results/Accountability were due to on-going issues with Agency-wide financial management practices and minor programmatic slips. NASA is making progress in improving the Agency's financial management system.

Resources, Facilities, and Major Assets

NASA's progress toward achieving Sub-goal 3C rests on the success of numerous planetary science orbiters, solar system probes, rovers, landers, and sample return missions. These missions are supported by laboratories at NASA Centers, including the Goddard Space Flight Center and the Jet Propulsion Laboratory, and at universities around the country. These laboratories provide years—and occasionally decades—of mission management, data collection, and analysis. Some missions, including Cassini/Huygens and Rosetta, are joint projects between NASA and international partners.

NASA's Planetary Data System (PDS) archives data by areas—atmospheres, geosciences, imaging, planetary plasma interactions, and small bodies—and makes data available to the planetary sciences community. Mission principal investigators comply with PDS standards to ensure the integrity and long-term usability of datasets. PDS is managed by NASA's National Space Science Data Center, the permanent archive for all NASA space science data, located at the Goddard Space Flight Center. NASA also supports extraterrestrial sample curation (storage and oversight of material returned from space) at the Johnson Space Center.

The cost of performance for Sub-goal 3C in FY 2006 is $1,948.93 million.

Stardust Samples Amaze Scientists

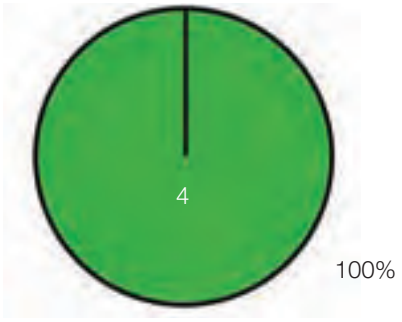
NASA's Stardust mission to explore comet Wild 2 successfully returned to Earth in a picture perfect landing on January 15, 2006. The spacecraft collected samples of gas and dust from the comet. "Ten years of planning and seven years of flight operations were realized early this morning when we successfully picked up our return capsule off of the desert floor in Utah," said Tom Duxbury, Stardust project manager at NASA's Jet Propulsion Laboratory, Pasadena, Calif. "The Stardust project has delivered to the international science community material that has been unaltered since the formation of our solar system."

In March, scientists discovered that dust samples from the comet unexpectedly contained mineral particles, such as Olivine, formed under high temperatures not usually associated with the frigid region known as the Kuiper belt where Wild 2 orbits. This finding alters the traditional view that comets are made of ice and dust composed largely of interstellar material gathered on the outskirts of the solar system. Instead, the finding suggests that the Sun may have spewed particles outward as its dusty disk, which eventually formed the solar system, swirled inward around the Sun like water circling a drain.

Stardust collected massive quantities of dust samples within each aerogel chamber. Due to the sample size, NASA and the Planetary Society posted photos from an automatic scanning microscope of the samples to the Stardust@home Web site and encouraged volunteers to search the photos for dust samples. Over 115,000 aspiring stardust hunters have pre-registered to search these photos.

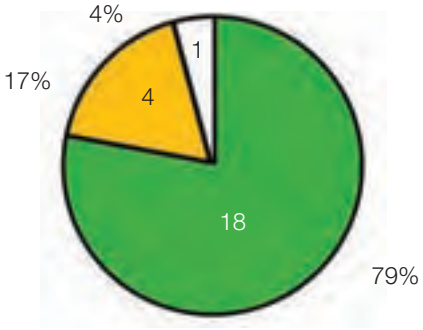
Above: Donald Brownlee, Stardust principal investigator with the University of Washington, flashes a victory sign for the successful arrival of Stardust material at the Johnson Space Center in January 2006. (NASA)
Left: Comet particles are trapped in aerogel in this photo taken of a Stardust sample. (NASA/JPL)

Outcome Ratings



Under Sub-goal 3C, NASA is on track to achieve all 4 Outcomes.

APG Ratings



Under Sub-goal 3C, NASA achieved 18 of 23 APGs.

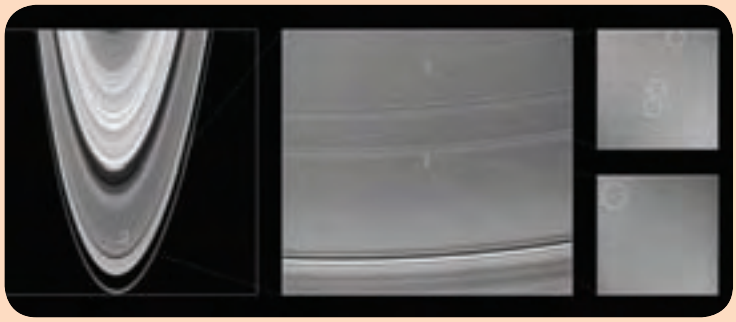
Outcome 3C.1: Progress in learning how the Sun's family of planets and minor bodies originated and evolved.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

Images from the Cassini spacecraft proved the existence of tiny "moonlets" in Saturn's rings—perhaps as many as 10 million within one of Saturn's rings alone. The moonlets' existence could help researchers determine if Saturn's rings formed as a result of a cataclysmic break-up of an orbiting body or if they are composed of the remnants from the disk of material that formed Saturn and its moons.

In a related finding, NASA researchers used the Hubble Space Telescope to image Uranus' ring system and discovered a dynamic interaction between meteoroids, Uranus' moons, and the planet's dusty rings. The Hubble images

Careful analysis of the highest-resolution images taken by Cassini's cameras as the spacecraft slipped into Saturn orbit revealed the four faint, propeller-shaped double-streaks in an otherwise bland part of the mid–A ring. Imaging scientists believe the "propellers" are the first direct observation of the dynamical effects of small moonlets, approximately 100 meters (300 feet) in diameter. These moonlets represent a hitherto unseen size-class of particles orbiting within the rings. The propellers are about 5 kilometers (3 miles) long from tip to tip, and the radial offset (the "leading" dash is slightly closer to Saturn) is about 300 meters (1,000 feet). (NASA/JPL/Space Science Institute)



revealed that meteoroids continually impact Uranus' moons, providing fresh dust and replenishing the rings, which are depleted through gravitational forces. This chaotic process of replenishing helps explain how planetary systems may have formed.

For the first time, Hubble imaged the dwarf planet Eris (formerly known as the 10th planet, or Xena) and found that it is only slightly larger than Pluto. Eris is 10 billion miles from Earth with a diameter a little more than half the width of the United States, but it is one of the brightest, most reflective objects in the solar system, possibly due to fresh methane frost on its surface.

New discoveries, like the dwarf planet Eris, the binary nature of Pluto and Charon, and other dwarf planetoids in the Kuiper belt, have ignited a heated debate among astronomers concerning the taxonomy of planets and fueled an investigation into the role of minor planets in the solar system. In January 2006, NASA launched the New Horizons spacecraft on a nine-year trip to Pluto. Data collected from New Horizons will help scientists understand the processes of planet formation and clarify the differences, if any, between planets and planetoids.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6SSE7 Green	Successfully demonstrate progress in understanding the initial stages of planet and satellite formation. Progress toward achieving outcomes will be validated by external expert review.	5SSE7 Green	4SSE12 Yellow	None
6SSE8 Green	Successfully demonstrate progress in understanding the processes that determine the characteristics of bodies in our solar system and how these processes operate and interact. Progress toward achieving outcomes will be validated by external expert review.	5SSE8 Blue	4SSE13 Green	3S3 Green
6SSE10 Green	Successfully demonstrate progress in learning what our solar system can tell us about extra-solar planetary systems. Progress toward achieving outcomes will be validated by external expert review.	5SSE10 Blue	4SSE15 Green	None
6SSE11 Green	Successfully demonstrate progress in determining the nature, history, and distribution of volatile and organic compounds in the solar system. Progress toward achieving outcomes will be validated by external expert review.	5SSE11 Green	4SSE16 Green	None
6SSE26 Green	Successfully return Stardust science samples to Earth.	None	None	None
6SSE27 Yellow	Successfully launch Dawn spacecraft.	None	None	None
6SSE28 White	Successfully complete MErcury Surface, Space ENvironment, GEochemistry, and Ranging (MESSENGER) flyby of Venus.	None	None	None

Performance Shortfalls

6SSE27: NASA postponed the Dawn mission launch until June 2007 due to technical delays and cost issues. The mission will study the dwarf planets Ceres and Vesta.

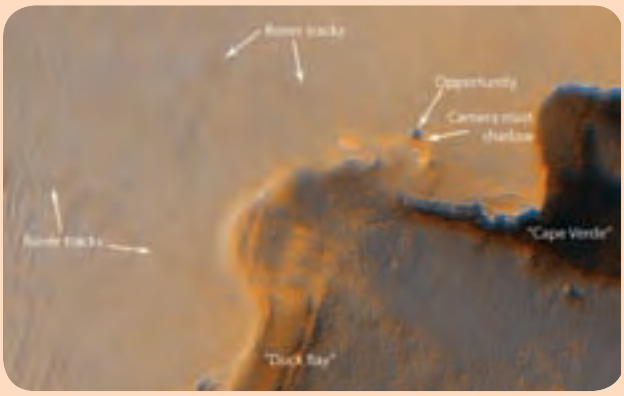
6SSE28: NASA erroneously included this APG in the FY 2006 Performance Plan. MESSENGER's scheduled flyby of Venus is October 23, 2006 (FY 2007).

Outcome 3C.2: Progress in understanding the processes that determine the history and future of habitability in the solar system, including the origin and evolution of Earth's biosphere and the character and extent of prebiotic chemistry on Mars and other worlds.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

NASA's Cassini spacecraft discovered liquid water reservoirs that erupt like geysers on Saturn's moon, Enceladus. These water plumes continuously recoat the moon's surface with highly reflective ice, making it one of the brightest objects in the solar system. The rare occurrence of liquid water so near the surface raises new questions about this mysterious moon and the solar system. If Cassini's discovery is correct, the solar system could be more diverse than previously theorized, possibly including environments suitable for life. Other moons in the solar system have liquid water oceans covered by kilometers of icy crust, but the pockets of liquid water on Enceladus may be just meters below the surface. NASA plans further observations in the spring of 2008 when the Cassini spacecraft will fly within 350 kilometers (about 220 miles) of Enceladus.

On Mars' surface, Mars Exploration Rovers, *Spirit* and *Opportunity*, continue to function, gathering a full Martian year data-set that provides detailed daily and seasonal changes in weather, temperature, and dust devil action. *Spirit* and *Opportunity* also collected geological data that revealed part of Mars' past environment, including evidence for the presence of water.



MRO spotted the long-lived *Opportunity* rover as it explored the edge of Victoria Crater. The level of detail in the photo from the high-resolution camera on MRO will help guide the rover's exploration of Victoria. Images from NASA's Mars Global Surveyor, orbiting the Red Planet since 1997, prompted the rover team to choose Victoria two years ago as the long-term destination for *Opportunity*. Exposed geological layers in the cliff-like portions of Victoria's inner wall appear to record a longer span of Mars' environmental history than similar strata that the rover has studied in smaller craters. Victoria is five times larger than any crater *Opportunity* has visited during its Martian trek. (NASA/JPL/UA)

In August 2006, the Mars Odyssey spacecraft completed its first extended mission to study the Martian surface and its geochemical composition. In addition to assessing the abundance of water, the Gamma-Ray Spectrometer suite onboard Odyssey collected data on the variations in atmospheric argon, traced the planetary carbon-dioxide cycle, and mapped the global distribution of important rock-forming elements, including iron, chlorine, silicon, potassium, and thorium.

NASA's Mars Reconnaissance Orbiter (MRO) achieved its science orbit on September 12, 2006, and began deploying its antenna and removing lens caps from its instruments. It will begin main science investigations in November. MRO is equipped with the Mars Climate Sounder, which will continually measure the structure of the Martian atmosphere, and the Mars Color Imager, which will provide daily global coverage of the weather. MRO's high-resolution imagers will track evidence of the history and distribution of water on Mars and identify potential future sites for exploration.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6SSE9 Yellow	Successfully demonstrate progress in understanding why the terrestrial planets are so different from one another. Progress toward achieving outcomes will be validated by external expert review.	5SSE9 Yellow	4SSE14 Green	3S5 Green

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6SSE12 Green	Successfully demonstrate progress in identifying the habitable zones in the solar system. Progress toward achieving outcomes will be validated by external expert review.	5SSE12 Green	4SSE17 Green	3S6 Green
6SSE13 Green	Successfully demonstrate progress in identifying the sources of simple chemicals that contribute to prebiotic evolution and the emergence of life. Progress toward achieving outcomes will be validated by external expert review.	5SSE13 Green	4SSE18 Green	3S6 Green
6SSE14 Green	Successfully demonstrate progress in studying Earth's geologic and biologic records to determine the historical relationship between Earth and its biosphere. Progress toward achieving outcomes will be validated by external expert review.	5SSE14 Green	4SSE19 Green	3S6 Green
6SSE15 Green	Successfully demonstrate progress in characterizing the present climate of Mars and determining how it has evolved over time. Progress toward achieving outcomes will be validated by external expert review.	5MEP7 Green	4MEP9 Green	None
6SSE16 Green	Successfully demonstrate progress in understanding the history and behavior of water and other volatiles on Mars. Progress toward achieving outcomes will be validated by external expert review.	5MEP8 Blue	4MEP10 Blue	None
6SSE17 Green	Successfully demonstrate progress in understanding the chemistry, mineralogy, and chronology of Martian materials. Progress toward achieving outcomes will be validated by external expert review.	5MEP9 Green	4MEP11 Blue	None
6SSE18 Green	Successfully demonstrate progress in determining the characteristics and dynamics of the interior of Mars. Progress toward achieving outcomes will be validated by external expert review.	5MEP10 Green	4MEP12 Green	None
6SSE19 Yellow	Successfully demonstrate progress in understanding the character and extent of prebiotic chemistry on Mars. Progress toward achieving outcomes will be validated by external expert review.	5MEP11 Yellow	4MEP13 Green	None
6SSE25 Green	Complete Mars Science Laboratory Preliminary Design Review (PDR).	5MEP4 Yellow	None	None

Performance Shortfalls

6SSE9: External reviewers deemed all of the evidence presented for this APG as positive. However, since the evidence was based on preliminary results, the external reviewers rated the progress on this goal as less robust than the progress seen in other areas of planetary science.

6SSE19: The lack of direct measurements has limited NASA's progress in this area. The next two Mars missions, Phoenix and the Mars Science Laboratory, have the technology to measure directly organic compounds and potentially elucidate the character and extent of pre-biotic chemistry.

Outcome 3C.3: Progress in identifying and investigating past or present habitable environments on Mars and other worlds, and determining if there is or ever has been life elsewhere in the solar system.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

After several months of aerobraking, during which a spacecraft uses friction from a planet's atmosphere to adjust its orbit, MRO achieved its science orbit in September 2006 and prepared to begin main science investigations in November. MRO's instruments will search for chemical and biological indications that the Red Planet had once—or still does—support life.

Data from *Spirit* and *Opportunity* show that specific epochs of Martian history were wet, strongly acidic, and oxidizing—an environment not conducive to the development of life on Mars. However, the recent discovery of liquid water on Enceladus suggests that habitable environments may exist elsewhere in the solar system. Further exploration is necessary to identify and characterize these new environments.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6SSE20 Yellow	Successfully demonstrate progress in searching for chemical and biological signatures of past and present life on Mars. Progress toward achieving outcomes will be validated by external expert review.	5MEP12 Green	4MEP14 Green	3S6 Green

Performance Shortfalls

6SSE20: The current missions at Mars, though providing data, do not possess technology to address this APG. The next two Mars missions, Phoenix and the Mars Science Laboratory, have the technology to measure organic compounds and mineralogy.

Outcome 3C.4: Progress in exploring the space environment to discover potential hazards to humans and to search for resources that would enable human presence.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

NASA catalogues and researches NEOs to track objects that could pose an impact hazard to Earth, to study these building blocks of the solar system's formation, and to discover their potential as raw materials for future space exploration. In FY 2006, asteroid search teams funded by NASA's Near Earth Object Program discovered 37 near-Earth asteroids larger than one kilometer. Scientists also found 642 smaller objects bringing the total number of known near-Earth objects (NEOs) to 4,201 for all sizes. NASA's Jet Propulsion Laboratory, which computes the orbits of NEOs, determined that none appear to pose a threat to Earth in the next century; however, the Jet Propulsion Laboratory is monitoring 802 NEOs, of which 134 are larger than one kilometer in diameter, that are in orbits that could become a hazard in the more distant future.

In 2006, NASA commissioned a study by external experts to estimate the total number of NEOs based on the distribution of objects found to date. The study team estimated the population of NEOs larger than one kilometer is indeed about 1,100 (plus or minus 75). However, the team found that mean reflectivity (the amount of light reflected off the surface of the asteroid as measured from ground-based telescopes) for these objects is 20-percent brighter than previously thought. This implies that previously discovered NEOs are all slightly smaller than originally estimated. As a result, scientists have adjusted the number of identified NEOs larger than one kilometer to 689—or 63 percent of the estimated 1,100 large NEOs.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6SSE5 Green	Successfully demonstrate progress in determining the inventory and dynamics of bodies that may pose an impact hazard to Earth. Progress toward achieving outcomes will be validated by external expert review.	5SSE5 Green	4SSE10 Green	None
6SSE6 Green	Successfully demonstrate progress in determining the physical characteristics of comets and asteroids relevant to any threat they may pose to Earth. Progress toward achieving outcomes will be validated by external expert review.	5SSE6 Blue	4SSE11 Green	3S8 Green
6SSE21 Green	Successfully demonstrate progress in identifying and understanding the hazards that the Martian environment will present to human explorers. Progress toward achieving outcomes will be validated by external expert review.	5MEP13 Green	4MEP15 Blue	3S8 Green
6SSE22 Green	Successfully demonstrate progress in inventorying and characterizing Martian resources of potential benefit to human exploration on Mars. Progress toward achieving outcomes will be validated by external expert review.	5MEP14 Yellow	4MEP16 Blue	3S8 Green
6SSE23 Green	Complete successful Martian orbit insertion for Mars Reconnaissance Orbiter (MRO).	5MEP2 Green	None	None

Sub-goal 3D *Discover the origin, structure, evolution, and destiny of the universe, and search for Earth-like planets.*

NASA uses space- and ground-based telescopes, computer models, and theoretical studies to explore and understand phenomena like black holes, extra-solar planets, stars and galaxies. This research may reveal answers to some of humankind's eternal questions: How did the universe begin? Will the universe have an end? Are humans alone in the universe?

In FY 2006, NASA missions explored how the universe began, probed the nature of gravity, searched for planets beyond the Sun's solar system, and observed the effects of event horizons around black holes, the theoretical "point of no return" where nothing, not even light, can escape the black hole's immense gravitational pull. The Agency also made progress in the quest to identify Earth-like extra-solar planets. Recent observations indicate that some types of stars have flattened debris disks and possibly planets orbiting them, increasing the likelihood of discovering an Earth-like planet in the future.

Risks to Achieving Strategic Sub-goal 3D

NASA's operating missions that are exploring the universe and searching for Earth-like planets are going well; however, schedule delays, cost growth, and technical difficulties have delayed development and deployment of some instruments and projects. NASA's next generation of observatories and planet-finder missions are more complex and challenging than any mission to date. Any delays in these projects, or in the Kepler planet-finding mission, will impact the Agency's ability to achieve the Outcomes under Sub-goal 3D.

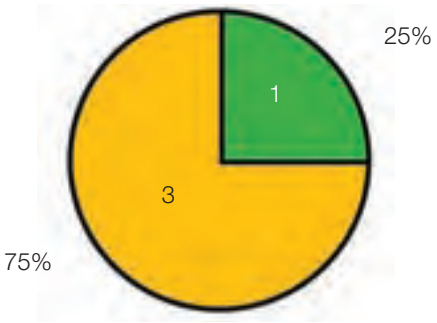
Resources, Facilities, and Major Assets

The biggest assets serving Sub-goal 3D are NASA's armada of operational spacecraft, including the three space telescopes comprising the Great Observatories: the Spitzer Space Telescope, the Hubble Space Telescope, and the Chandra X-ray Observatory. NASA also is developing next-generation astrophysics missions, including JWST, the Space Interferometer Mission (SIM), the Gamma-ray Large Space Telescope (GLAST), the Kepler mission, and the Wide Field Infrared Survey Explorer (WISE).

NASA also supports the Keck Interferometer, a ground-based telescope located atop the dormant volcano Mauna Kea in Hawaii. The Keck Interferometer combines the light from the twin Keck 10 meter diameter telescopes to search for planets in other solar systems.

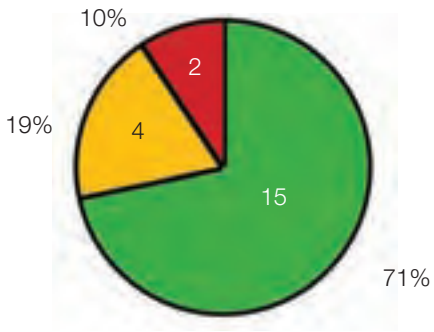
The cost of performance for Sub-goal 3D in FY 2006 was $1,910.95 million.

Outcome Ratings



Under Sub-goal 3D, NASA is on track to achieve 1 of 4 Outcomes.

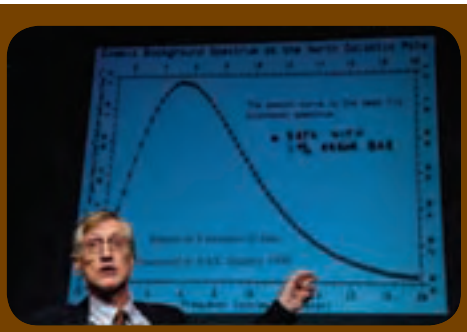
APG Ratings



Under Sub-goal 3D, NASA achieved 15 of 21 APGs.

NASA Scientist Shares Nobel Prize in Physics

John Mather, scientist at the Goddard Space Flight Center, and George Smoot, professor at the University of California, won the 2006 Nobel Prize in Physics for their collaborative work on understanding the Big Bang using data from NASA's Cosmic Background Explorer (COBE). COBE searched for cosmic microwave background radiation (leftover energy from the Big Bang) and paved the way for current microwave mapping techniques. The data provides evidence supporting the Big Bang theory by discovering variations in radiation and temperatures associated with the beginning of the universe.



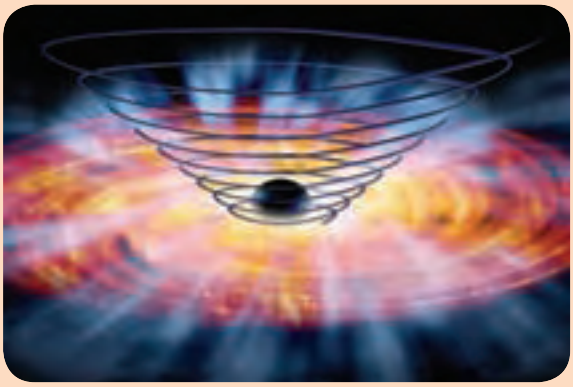
Left: John Mather shows some of the earliest data from the NASA Cosmic Background Explorer (COBE) spacecraft during a press conference held at NASA Headquarters. (NASA)

Outcome 3D.1: Progress in understanding the origin and destiny of the universe, phenomena near black holes, and the nature of gravity.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

In FY 2006, NASA scientists analyzed more than 100 supernovae, many discovered by the Hubble Space Telescope. Supernovae surveys enable NASA to identify a common type of stellar explosion that provides a spatial reference throughout the galaxy. They also provide a basis for studying the origins of dark energy, a mysterious force that appears to make up about 74 percent of the universe and may be responsible for the present-day acceleration of the expansion of the universe.

NASA's Wilkinson Microwave Anisotropy Probe (WMAP) has been instrumental in increasing scientists' understanding of the universe and its origin. In FY 2006, NASA used the data from WMAP to build the most detailed temperature map of the universe ever and the first full-sky map showing the "polarization" direction of the oldest light in the universe. The WMAP data will help researchers pinpoint when the first stars formed and give scientists new insight into the events that transpired in the first trillionth of a second of the universe.



During FY 2006, data from the Chandra X-ray Observatory showed for the first time how powerful magnetic fields are critical to the radiation emitted by black holes. The black hole's rotation twists magnetic fields, shown here as black lines in this simplified image. These fields accelerate the charged gas falling into the black hole, generating radiation that is seen as bright flashes by Chandra. (NASA/CXC/M.Weiss)

At the start of this fiscal year, NASA completed the Gravity Probe–B mission designed to test Einstein's theory of general relativity. While the nearly year-long mission is over, NASA scientists have just started analyzing the data.

In FY 2006, scientists at the Massachusetts Institute of Technology and Harvard University used data from NASA's Rossi X-ray Timing Explorer (RXTE) satellite to confirm the presence of theoretical borders around black holes called event horizons. RXTE also was instrumental in identifying a medium-sized black hole in the M82 galaxy cluster. This data is the first confirmation of the existence of a medium-sized black hole—one that is larger than the common stellar mass black holes and smaller than the super massive black holes that reside at the core of most galaxies.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6UNIV8 Green	Successfully demonstrate progress in searching for gravitational waves from the earliest moments of the Big Bang. Progress toward achieving outcomes will be validated by external expert review.	5SEU4 Green	4SEU9 Green	None

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6UNIV9 Green	Successfully demonstrate progress in determining the size, shape, and matter–energy content of the universe. Progress toward achieving outcomes will be validated by external expert review.	5SEU5 Blue	4SEU10 Green	3S1 Blue
6UNIV10 Green	Successfully demonstrate progress in measuring the cosmic evolution of dark energy. Progress toward achieving outcomes will be validated by external expert review.	5SEU6 Green	4SEU11 Blue	None
6UNIV11 Green	Successfully demonstrate progress in determining how black holes are formed, where they are, and how they evolve. Progress toward achieving outcomes will be validated by external expert review.	5SEU7 Green	4SEU12 Green	None
6UNIV12 Green	Successfully demonstrate progress in testing Einstein's theory of gravity and mapping space–time near event horizons of black holes. Progress toward achieving outcomes will be validated by external expert review.	5SEU8 Yellow	4SEU13 Green	3S2 Green
6UNIV13 Green	Successfully demonstrate progress in observing stars and other material plunging into black holes. Progress toward achieving outcomes will be validated by external expert review.	5SEU9 Blue	4SEU14 Green	None
6UNIV15 Green	Successfully demonstrate progress in exploring the behavior of matter in extreme astrophysical environments, including disks, cosmic jets, and the sources of gamma-ray bursts and cosmic rays. Progress toward achieving outcomes will be validated by external expert review.	5SEU11 Blue	4SEU16 Green	3S2 Green
6UNIV19 Yellow	Complete Gamma-ray Large Area Space Telescope (GLAST) spacecraft Integration and Test (I&T).	5SEU1 Yellow	None	None
6UNIV20 Red	Complete James Webb Space Telescope (JWST) mission Preliminary Design Review (PDR).	None	None	None

Performance Shortfalls

6UNIV19: NASA postponed the GLAST I&T and rescheduled the launch for early FY 2007.

6UNIV20: NASA revised the JWST schedule in response to growth in the cost estimate that NASA had identified in FY 2005. The Agency moved the launch date to 2013 and the PDR to March 2008.

Outcome 3D.2: Progress in understanding how the first stars and galaxies formed, and how they changed over time into the objects recognized in the present universe.

FY 2006	FY 2005	FY 2004	FY 2003
Yellow	None	None	None

This year, scientists using NASA's Spitzer Space Telescope detected light that may be emanating from the earliest stars formed in the universe. Current theory suggests that space, time, and matter began with a "Big Bang" 13.7 billion years ago. Two hundred million years after that, the first stars formed. Scientists pointed Spitzer's infrared array camera at the Draco constellation to capture a diffuse glow of infrared light, invisible to the naked eye. The research team at the Goddard Space Flight Center believes that the glow is coming from a hypothesized class of stars believed to be the first stars formed in the universe, or perhaps from hot gas falling into the first black holes.

Two of NASA's Great Observatories, the Spitzer and the Hubble Space Telescope, provided data that is enabling scientists to "weigh" the stars in several distant galaxies. One of these galaxies, among the most distant ever seen, appears to be unusually massive and mature for its place in the young universe. This came as a surprise to astronomers since the earliest galaxies in the universe are commonly thought to have been much smaller groups of stars that gradually merged to build large galaxies like the Milky Way.

A team of astronomers also used Spitzer to discover and catalog nearly 300 clusters of galaxies. Almost one third of the clusters are as far as 10 billion light-years away, dating back to when the universe was very young. Galaxy

clusters, especially young clusters, provide researchers with insight into how the first stars and massive galaxies formed.

Galactic collisions are a driving force behind star formation and the redistribution of stellar material throughout the universe. Spitzer recently observed an ongoing collision between the galaxy M82 and its neighbor M81. This collision produced a plume of hot dust stretching 20,000 light years from M82 into intergalactic space. If enough dust is released, a new galaxy or stellar cluster could form from this cosmic crash.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6UNIV14 Green	Successfully demonstrate progress in determining how, where, and when the chemical elements were made, and in tracing the flows of energy and magnetic fields that exchange them between stars, dust, and gas. Progress toward achieving outcomes will be validated by external expert review.	5SEU10 Green	4SEU15 Green	None
6UNIV16 Yellow	Successfully demonstrate progress in discovering how the interplay of baryons, dark matter, and gravity shapes galaxies and systems of galaxies. Progress toward achieving outcomes will be validated by external expert review.	5SEU12 Green	4SEU17 Green	3S1 Blue
6UNIV17 Green	Successfully demonstrate progress in learning how the cosmic web of matter organized into the first stars and galaxies and how these evolved into the stars and galaxies we see today. Progress toward achieving outcomes will be validated by external expert review.	5ASO5 Green	4ASO9 Blue	3S3 Green
6UNIV20 Red	Complete James Webb Space Telescope (JWST) mission Preliminary Design Review (PDR).	None	None	None

Performance Shortfalls

Outcome 3D.2: NASA made scientific progress toward the Outcome, but delays in the development and launch of JWST will impact future results. NASA postponed the launch date to 2013.

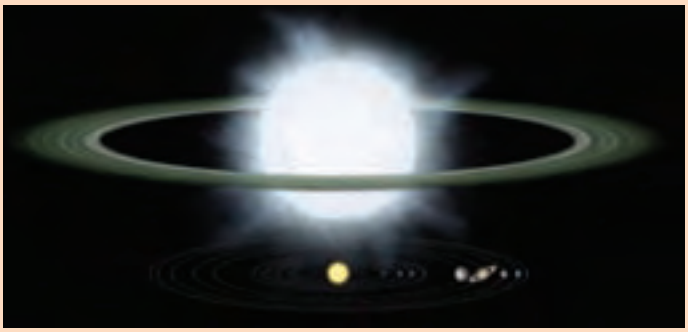
6UNIV16: External reviewers determined that NASA made limited progress in discovering how the interplay of baryons, dark matter, and gravity shapes galaxies and systems of galaxies.

6UNIV20: See Outcome 3D.1, above.

3D.3: Progress in understanding how individual stars form and how those processes ultimately affect the formation of planetary systems.

FY 2006	FY 2005	FY 2004	FY 2003
Yellow	None	None	None

Recent discoveries revealed that the physical processes governing planet formation could occur under harsher conditions than originally thought. In FY 2006, researchers using NASA telescopes spotted planets, or planet-forming materials, around some unlikely places like brown dwarfs, which do not have sufficient mass to become true stars. Even dead stars may have a second chance at planet formation. Data from the Spitzer Space Telescope showed a planetary ring around a pulsar in the Cassiopeia constellation. In the star explosion that formed the pulsar, the original planets would have been destroyed; however, clumping in this disk could produce a new, albeit



In February 2006, NASA announced that the Spitzer Space Telescope identified two huge "hypergiant" stars circled by monstrous disks of what might be planet-forming dust (shown in this illustration compared to the Sun's solar system). Before this finding, scientists believed that such large stars were inhospitable to planets. The Spitzer finding expands the range of stars that can support dusty disks to include hypergiants. (NASA/JPL–Caltech/R. Hurt)

stark, set of planets. These discoveries indicate that the process of star collapse can produce planet-forming disks.

NASA observations of the dusty material orbiting stars have revealed an abundance of carbon. Astronomers using data from NASA's Far Ultraviolet Spectroscopic Explorer (FUSE) observed large amounts of carbon gas in a dusty disk surrounding a young star named Beta Pictoris. Scientists are unsure if this system will give birth to worlds that are rich in graphite and methane or if the carbon is a common characteristic of young solar systems. NASA's Spitzer Space Telescope also observed carbon gas around a star in the Ophiuchus system, IRS 46. In contrast to the FUSE data, the data from Spitzer's infrared spectrometer identified carbon and nitrogen in the form of complex organic chains. These same building blocks are present in the Sun's solar system and were likely necessary for the development of life on Earth.

Delays in the SOFIA and JWST Programs will slow progress toward this Outcome because the Agency needs these two new observatories to continue studying star formation. In March 2006, NASA reviewed the status of SOFIA to identify and analyze options and decided to continue the SOFIA Program pending a restructuring, including joint management of the SOFIA airborne system (aircraft and telescope) development and flight-testing by NASA's Dryden Flight Research Center and the German Space Agency. The Agency plans to ferry the SOFIA airborne system to Dryden in early 2007 to initiate the extensive flight tests. NASA currently estimates that the flight test will conclude in 2010, after which the Agency will conduct an operational readiness review before beginning full science observation missions.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6UNIV1 Green	Successfully demonstrate progress in understanding how different galactic ecosystems of stars and gas formed and which ones might support the existence of planets and life. Progress toward achieving outcomes will be validated by external expert review.	5ASO6 Green	4ASO10 Green	None
6UNIV2 Green	Successfully demonstrate progress in learning how gas and dust become stars and planets. Progress toward achieving outcomes will be validated by external expert review.	5ASO7 Green	4ASO11 Green	3S3 Green
6UNIV6 Green	Successfully demonstrate progress in tracing the chemical pathways by which simple molecules and dust evolve into the organic molecules important for life. Progress toward achieving outcomes will be validated by external expert review.	5ASO11 Green	4ASO15 Green	2S6 Green
6UNIV18 Red	Complete Stratospheric Observatory for Infrared Astronomy (SOFIA) Airworthiness Flight Testing.	5ASO1 Red	None	None
6UNIV20 Red	Complete James Webb Space Telescope (JWST) mission Preliminary Design Review (PDR).	None	None	None

Performance Shortfalls

Outcome 3D.3: NASA made scientific progress on this Outcome, but future results will be impacted by delays in the development and deployment of the next generation of flight instruments.

6UNIV18: NASA delayed the SOFIA Airworthiness Flight Test.

6UNIV20: See Outcome 3D.1, above.

Outcome 3D.4: Progress in creating a census of extra-solar planets and measuring their properties.

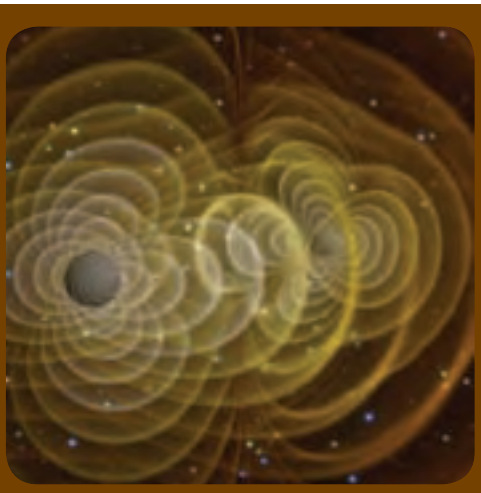
FY 2006	FY 2005	FY 2004	FY 2003
Yellow	None	None	None

FY 2006 proved eventful for NASA's extra-solar planet hunt. Using NASA's space observatories and ground-based telescopes, an international team of astronomers found the smallest planet ever detected around a normal star outside this solar system. The extra-solar planet is five times as massive as Earth and orbits a red dwarf, a relatively

When Black Holes Collide

Einstein's theory of general relativity predicts that a collision between supermassive black holes will not radiate light like a supernova. Instead, it will emit gravity waves. These waves cause space-time to jiggle like a bowl of Jell-O (as shown in the illustration, right) and, because they rarely interact with matter, can penetrate the dust and gas that normally block scientists' view of black holes and other objects.

Scientists at the Goddard Space Flight Center have made a gigantic step towards detecting these waves. The NASA Ames Research Center tested a three-dimensional model, which simulates gravity waves during a collision between black holes of the same mass, using NASA's Columbia supercomputer and some of the most complicated astrophysical calculations ever performed. Scientists will be able to compare these results with data collected by the National Science Foundation's ground-based Laser Interferometer Gravitational-Wave Observatory (LIGO) and the proposed Laser Interferometer Space Antenna (LISA), a joint NASA–European Space Agency project, in order to confirm Einstein's theory.



(Henze, NASA)

cool star, every 10 years. The distance between the planet, designated OGLE-2005-BLG-390Lb, and its host is about three times greater than the distance between Earth and the Sun. The planet's large orbit and its dim parent star make its likely surface temperature a frigid minus 364 degrees Fahrenheit (minus 220 degrees Celsius).

Researchers using the Spitzer Space Telescope detected a "hot Jupiter," a large gas giant planet that reflects considerable infrared radiation. The planet orbits relatively close to its star (closer than Earth's orbit around the Sun) and has a scorching temperature of 1,551 degrees Fahrenheit—hot enough to stand out despite the close presence of its parent star.

In February 2006, an international team of amateur and professional astronomers, using off-the-shelf equipment provided by NASA, confirmed that they had discovered a Jupiter-sized planet circling a Sun-like star 600 light-years from Earth. NASA brought amateur astronomers into the Agency's extra-solar planet hunt back in 2002 as a way to expand the search team while engaging the public.

Funding pressures within the Agency's Astrophysics Division and delays with the Kepler mission will impact future planet-finding missions. Kepler, a NASA Discovery mission designed to look at a wide field of stars for transitioning planets, has contractor and workforce issues with regard to the primary instrument. The launch readiness date for Kepler slipped from June 2008 to November 2008, resulting in a subsequent delay for supported missions.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6UNIV3 Green	Successfully demonstrate progress in observing planetary systems around other stars and comparing their architectures and evolution with our own. Progress toward achieving outcomes will be validated by external expert review.	5ASO8 Green	4ASO12 Blue	3S4 Blue
6UNIV4 Green	Successfully demonstrate progress in characterizing the giant planets orbiting other stars. Progress toward achieving outcomes will be validated by external expert review.	5ASO9 Blue	4ASO13 Green	3S4 Blue
6UNIV5 Yellow	Successfully demonstrate progress in determining how common Earth-like planets are and whether any might be habitable. Progress toward achieving outcomes will be validated by external expert review.	5ASO10 Blue	4ASO14 Green	None
6UNIV7 Green	Successfully demonstrate progress in developing the tools and techniques to search for life on planets beyond our solar system. Progress toward achieving outcomes will be validated by external expert review.	5ASO12 Green	4ASO16 Blue	3S4 Blue 3S6 Green
6UNIV21 Yellow	Begin Kepler spacecraft Integration and Test (I&T).	5ASO2 Green	None	None

Performance Shortfalls

Outcome 3D.4: NASA made scientific progress on this Outcome, but future results will be impacted by delays in the development and deployment of the next generation of flight instruments.

6UNIV5: Continued delays of SIM and Kepler constitute slow progress toward achieving this APG.

6UNIV21: NASA delayed the Kepler spacecraft I&T.

Sub-goal 3E *Advance knowledge in the fundamental disciplines of aeronautics, and develop technologies for safer aircraft and higher capacity airspace systems.*

NASA is the Nation's leading government organization for aeronautical research. This world-class capability is built on a tradition of expertise in core disciplines like aerodynamics, acoustics, combustion, materials and structures, and dynamics and control. NASA's Aeronautics Research Mission Directorate conducts research that will enhance significantly aircraft performance, environmental compatibility, and safety, and that will also enhance the capacity, flexibility, and safety of the future air transportation system.

In FY 2006, NASA substantially restructured the Aeronautics Research Mission Directorate to focus on cutting-edge fundamental research and revolutionary capabilities that will benefit NASA, other government agencies, the broad aeronautics community, and the Nation. As part of this restructuring, NASA created the following four new programs:

- The Fundamental Aeronautics Program develops system-level, multi-disciplinary capabilities in critical core areas of aeronautics technology for both civilian and military applications;
- The Aviation Safety Program develops principles, guidelines, concepts, tools, methods, and technologies to improve aviation safety;
- The Airspace Systems Program develops technologies, concepts, and capabilities for operational management of the National Airspace System and the aircraft that fly within it; and
- The Aeronautics Test Program stewards the Agency's key aeronautics test facilities, some of which are considered national assets.

Risks to Achieving Sub-goal 3E

NASA identifies highly challenging, cutting-edge aeronautics research goals which, by their nature, are inherently high risk. Even if each milestone is not met fully, the information NASA gains advances knowledge of aeronautics and helps the Agency make informed decisions to realign research to the appropriate areas. Redirection of resources to meet other national priorities is another major risk to NASA's programs and schedules. Should this occur, the Aeronautics Research Mission Directorate will re-align program milestones and schedules as needed to respond to such changes.

The Fundamental Aeronautics, Aviation Safety, and Airspace Systems Programs partner with other government agencies, industry, and universities to meet program objectives. These partnerships provide many benefits, but also introduce external dependencies that could influence schedules and research output. The programs will mitigate this risk through close coordination with these partners.

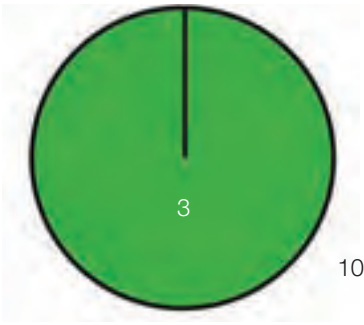
Resources, Major Facilities, and Assets

NASA maintains several national aeronautics research assets, including wind tunnels at the Ames, Glenn, and Langley Research Centers. Facilities like the Icing Research Tunnel, the 8-foot High Temperature Tunnel, and the Thermal/Acoustic Facility allow NASA and Agency partners to test aircraft under various conditions.

In addition to ground-based test and research facilities, NASA maintains a number of research aircraft, including F-15 and F-18 jets used to test new systems, icing research aircraft like the twin-engine turboprop Twin Otter, subsonic research aircraft like the twin turbo-fan Gulfstream III, and the C-17 transport aircraft. NASA houses most of these aircraft at the Dryden Flight Research Center, the Agency's flight research and test hub.

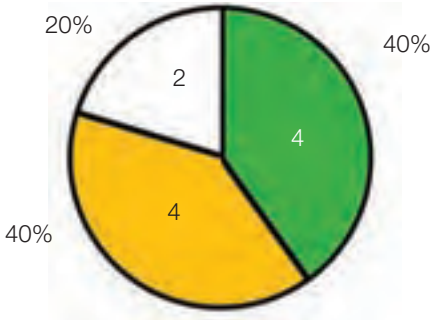
The estimated cost of performance for Sub-goal 3E was $1,050.00 million.

Outcome Ratings



Under Sub-goal 3E, NASA is on track to achieve all 3 Outcomes.

APG Ratings



Under Sub-goal 3E, NASA achieved 4 of 10 APGs.

Outcome 3E.1: By 2016, identify and develop tools, methods, and technologies for improving overall aircraft safety of new and legacy vehicles operating in the Next Generation Air Transportation System (projected for the year 2025).

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

During FY 2006, the Aeronautics Research Mission Directorate realigned the Aviation Safety Program into four project areas that focus on the foundational technologies needed to address safety issues of current and future air vehicles that will be operating in the Next Generation Air Transportation System:

- The Aircraft Aging and Durability project supports research to predict, detect, and/or mitigate damage or degradation of aircraft materials and structures due to aging related hazards;
- The Integrated Intelligent Flight Deck project develops flight deck technologies that mitigate operator-, automation-, and environment-induced hazards for future operational concepts;
- The Integrated Vehicle Health Management project develops technologies to detect and correct system/component degradation and malfunctions early enough to prevent or recover from an in-flight failure that could lead to an accident; and
- The Integrated Resilient Aircraft Control project develops capabilities to reduce (or eliminate) aircraft loss-of-control accidents and ensure safe flight under off-nominal conditions.

A dynamically scaled Generic Transport Model, part of the AirSTAR testbed, is shown coming in for a landing. NASA will use it for flight validation of high-risk upset flight maneuver and damage conditions, along with validation of resilient control algorithms and advanced adaptive control systems. (NASA)

During FY 2006, the Aviation Safety Program conducted computer modeling of crack growth in aging aircraft to develop failure mitigation techniques and to help engineers design more damage-tolerant materials. In addition, the program made improvements to the NASA Icing Research Tunnel facility to enable research on super-cooled liquid droplets. In April 2006, the program completed a live demonstration of new data mining tools. The data mining tools will be used to query information from a distributed archive of flight operational data held by participating operators. The goal of this activity is to use operational flight data to detect technical flaws or unsafe conditions early enough to avert accidents. The program also completed the Airborne Subscale Transport Aircraft Research (AirSTAR) testbed and began demonstrating operational readiness in September. NASA will use the AirSTAR test bed to flight test technologies that will require unusual attitude conditions that cannot be safely achieved by a full-scale civil transport category aircraft.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6AT4 Green	In partnership with the FAA, the Commercial Aviation Safety Team (CAST), and the aviation community, provide an initial demonstration of a voluntary aviation safety information sharing process.	None	None	None
6AT14 Yellow	Complete Aviation Safety Program restructuring activities in order to focus research efforts more precisely on the Nation's aviation safety challenges for the Next Generation Air Transportation System (2025) and beyond.	None	None	None
6AT15 Yellow	Utilizing a competitive peer-reviewed selection process, determine the research portfolio and partnerships to enable advances in the Aviation Safety thrust areas (Integrated Intelligent Flight Deck Technologies, Integrated Vehicle Health Management, Integrated Resilient Aircraft Controls, and Aircraft Aging and Durability).	None	None	None

Performance Shortfalls

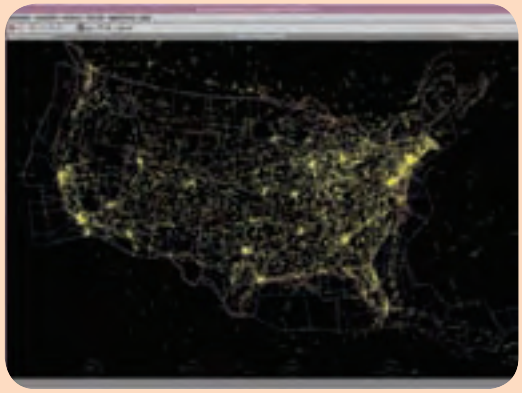
6AT14 and 6AT15: The Aviation Safety Program delayed approval of one of its four projects: the Integrated Resilient Aircraft Control, which develops capabilities to reduce (or eliminate) aircraft loss-of-control accidents and ensure safe flight under off-nominal conditions. Program management expects final approval of this project during the first quarter of FY 2007.

Outcome 3E.2: By 2016, develop and demonstrate future concepts, capabilities, and technologies that will enable major increases in air traffic management effectiveness, flexibility, and efficiency, while maintaining safety, to meet capacity and mobility requirements of the Next Generation Air Transportation System.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

NASA successfully completed the Small Aircraft Transportation System (SATS) project in FY 2006. The project focused on improving four operating capabilities: higher-volume operations at airports without traffic-control towers or radar; lower landing minimums at minimally equipped airfields; increased single pilot performance; and en-route procedures for integrated fleet operations. SATS conducted final assessments and evaluations, and published the project's successes in the Air Traffic Control Association's Journal of Air Traffic Control.

The Virtual Airspace Modeling and Simulation (VAMS) project successfully developed its system-wide operational concept, which provides a detailed description of a future capacity-enhancing concept for the National Airspace System and an assessment of its potential capacity benefits. The assessment was performed using the VAMS-developed Airspace Concepts Evaluation System (ACES) assessment tool that models gate-to-gate operations of the National Airspace System. Using ACES, VAMS demonstrated that the system-wide concept could accommodate the targeted doubling of capacity (relative to 1997 throughput).



Thousands of aircraft cross the United States in this FACET snapshot of air traffic taken on July 10, 2006, at 2:45 p.m. EST. Originally developed by the Ames Research Center as a research tool to explore traffic management concepts, FACET has transitioned to a commercially licensed traffic management tool. NASA continues to use the tool in the Agency's aeronautics research. (NASA)

The Future Air Traffic Management Concepts Evaluation (FACET) Tool won NASA's Software of the Year Award for 2006. FACET is a flexible software tool that models the National Airspace System. Its powerful simulation

capabilities can rapidly generate thousands of aircraft trajectories to enable efficient planning of traffic flows at the national level.

NASA restructured the Airspace Systems Program to align research efforts with the Joint Planning and Development Office's Next Generation Air Transportation System (NGATS) goals for 2025. (The Joint Planning and Development Office is a collaboration among government agencies, industry, and the public sector to plan and enable NGATS.) NASA identified major research thrust areas: the NGATS Air Traffic Management Airspace project and the NGATS Air Traffic Management Airportal project. The program focuses on finding technological solutions for automated air traffic management as a step toward creating a safe, efficient, high-capacity, and integrated NGATS.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6AT7 Green	Successfully complete the SATS integrated technology demonstration and final assessment.	None	None	None
6AT16 Yellow	Complete Airspace Systems Program restructuring activities in order to align research efforts to address the Joint Planning and Development Office's Next Generation Air Transportation System (NGATS) capability requirements for 2025.	None	None	None
6AT17 Yellow	Utilizing a competitive peer-reviewed selection process, determine the research portfolio and partnerships to enable advances in the Airspace Systems thrust areas (Next Generation Air Transportation Systems and Super Density Surface Management).	None	None	None

Performance Shortfalls

6AT16 and 6AT17: The Airspace Systems Program delayed approval of a portion of its project portfolio (the NGATS Air Traffic Management Airportal project) that will develop capabilities to increase throughput in terminal and airport domains enabling NGATS. Program management expects final approval of this project, including its peer-reviewed research portfolio and partnerships, during the first quarter of FY 2007.

Outcome 3E.3: By 2016, develop multidisciplinary design, analysis, and optimization capabilities for use in trade studies of new technologies, enabling better quantification of vehicle performance in all flight regimes and within a variety of transportation system architectures.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

The Fundamental Aeronautics Program is focusing on long-term investments in cutting-edge fundamental research in traditional aeronautics disciplines. The key objectives guiding this new focus are to re-establish NASA's commitment to mastering the fundamental technology of subsonic (rotary and fixed wing), supersonic, and hypersonic flight, and to focus NASA's unique research capabilities in areas that have the potential to expand the capabilities of future aircraft for the greatest national benefit (e.g., higher performance, lower noise, and reduced emissions). All four projects within the program had significant accomplishments, including those listed below.

The Rotary Wing project conducted a helicopter flight test to provide data for rotorcraft acoustic analysis validation and to develop low-noise flight profiles. NASA conducted the test with project partners: the U.S. Army, the Center for Rotorcraft Innovation, Bell Helicopter, and the University of Maryland. The project team will use the results of these tests to validate advanced prediction models that can be used for future design exercises.

NASA's Fixed Wing project, in collaboration with Pratt & Whitney, completed the design of geared turbofan components. Based on studies, the project partners selected a design—a low fan-pressure-ratio geared turbofan with a lightweight Variable Area Fan Nozzle—that reduces both noise and emissions relative to current engines.

The Supersonics project completed an initial study of the impact of atmospheric turbulence on very-low-noise sonic boom waveforms. NASA used F-18 aircraft, flying a specially designed flight profile, to generate the booms,

which occur when aircraft fly faster than the speed of sound. NASA recorded indoor and outdoor waveform shapes, noise levels, and building vibration data for use in model validation studies. This research will help project engineers develop ways to reduce the sonic-boom noise produced by supersonic aircraft.

The Hypersonics project completed the Mach 5 testing of the Ground Demonstration Engine–2 in the NASA 8-Foot High Temperature Tunnel. NASA teamed with the Air Force Research Laboratory and Pratt & Whitney Rocketdyne to complete the tests. The NASA tests marked the first time a closed-loop, hydrocarbon-fueled, fuel-cooled scramjet was tested at hypersonic conditions. Fuel cooling of the scramjet is essential for the hardware to survive the temperatures found in hypersonics flight.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6AT8 White	Identify and document engine configuration and noise reduction technologies needed to enable 10 dB reduction in aircraft system noise. (APG revised based on FY06 Appropriation.)	5AT4 Green	None	None
6AT11 White	Complete trade study of unconventional propulsion concepts for a zero-emissions vehicle.	None	None	None
6AT18 Green	Complete Fundamental Aeronautics Program restructuring activities in order to focus efforts on fundamental research to develop physics-based multidisciplinary design, analysis, and optimization tools.	None	None	None
6AT19 Green	Utilizing a competitive peer-reviewed selection process, determine the research portfolio and partnerships to enable advances in the Fundamental Aeronautics thrust areas (fixed wing, rotary wing, supersonics, and hypersonics).	None	None	None

Performance Shortfalls

6AT8 and 6AT11: NASA canceled these APGs because they no longer aligned with the Agency's aeronautics research goals.

Sub-goal 3F

Understand the effects of the space environment on human performance, and test new technologies and countermeasures for long-duration human space exploration.

Human exploration is the cornerstone of the Vision for Space Exploration. The space environment holds many challenges for the human body, including exposure to radiation, atrophy of unused muscles, and calcium loss in weight-bearing bones that reduces bone density and increases fracture risks. NASA is researching and developing the countermeasures necessary to assure the health of today's astronauts and the next generation of human explorers.

NASA is preparing not only for extraordinary hazards associated with space travel, but also for the everyday problems that human explorers may face on extended duration missions. Researchers are looking at seemingly simple issues like crew comfort, food preparation, and life-support while also preparing for potentially hazardous major events like spacecraft fires and solar flares. In FY 2006, NASA prepared for long-duration human space exploration missions by testing spacesuits for comfort and mobility, conducting bed rest studies, developing experiments for the International Space Station (ISS), and continuing other life support projects.

Assuring the health of human space explorers begins on the ground, so this Sub-goal also covers the Agency's medical certification program that confirms all astronauts are fit to fly and perform their duties.

NASA is developing Advanced Environmental Monitoring and Control systems for flight on the ISS (and ultimately Orion) to detect harmful contaminants in the atmosphere and alert the crew. In this photo, project scientist Jake Maule uses the Lab-on-a-Chip Application Development (LOCAD)–Portable Test System, a hand-held device for rapid detection of potentially harmful biological and chemical substances, aboard NASA's KC-135 microgravity research aircraft. (NASA)

Risks to Achieving Sub-goal 3F

NASA's research and development efforts for human exploration rely on national and international partnerships that enable NASA to expand the Agency's pool of research data and reduce redundant efforts. NASA has established relationships with the Agency's partners through both the International Space Life Sciences Working Group and ISS partnerships. NASA also relies on access to the Russian Institute of Biomedical Problems, the MEDES Institute for Space Medicine and Physiology bed rest and centrifuge facility in Toulouse, France, and the German Space Agency's bed rest and centrifuge facility in Cologne, Germany. NASA's Human Research Program (the program responsible for developing human spaceflight countermeasures) depends on maintaining good relations with the Department of Energy to assure availability of critical radiation research facilities at the Brookhaven NASA Space Research Laboratory. Like any cooperative effort, these partnerships create the potential for delays, which could affect the development of exploration technologies.

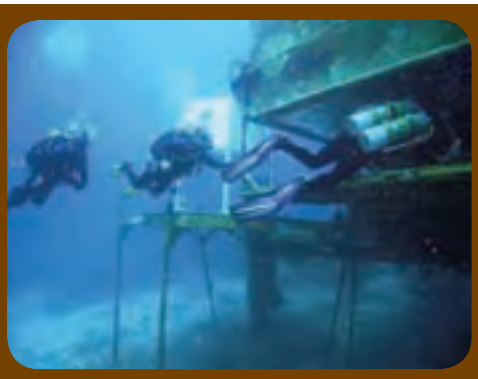
Additional internal risks include cross-program management between the Agency's Human Research Program and related work in Constellation Systems. Changes in the ISS/Shuttle manifest schedule also could impact progress toward this Sub-goal.

Resources, Facilities, and Major Assets

NASA uses numerous ground-based research facilities to support human exploration efforts like the 2.2- and 5-second Drop Towers at the Glenn Research Center, which support short-term microgravity studies without an ISS mission or parabolic flights. These facilities enable space-related research at reduced risk and cost in comparison with flight missions; however, they cannot substitute for the necessary experience of living and working in space.

NASA Tests Space Capabilities at Undersea Lab

The NASA Extreme Environment Mission Operations (NEEMO) uses an undersea laboratory to test technologies and capabilities for future human space exploration. During FY 2006, NASA conducted three NEEMO missions at the Aquarius Underwater Laboratory, located off the coast of Key Largo, Florida. The laboratory's remote location and extreme environment makes it a good analog for space exploration. During the missions, the crew conducted "moon walks" to collect "lunar" samples and constructed a Waterlab. They tested techniques for communication and navigation and used a remote-operated vehicle, affectionately named Scuttle by the crew, to determine its usefulness in various situations such as night exploration. In addition, the crew of NEEMO–9 assisted a doctor while he performed remote long-distance surgery on a simulated wound, testing technologies that could be used for future telemedicine on Earth or in space.

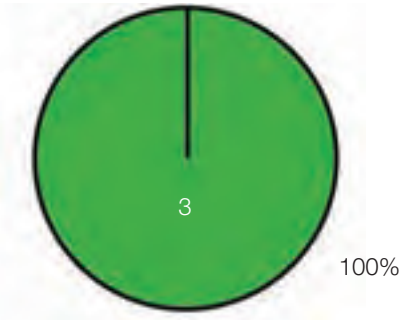


crew members for the NEEMO–9 mission arrive at their underwater home on April 3, 2006. The crew stayed inside the Aquarius Underwater Laboratory for 15 days. (NASA)

NASA's largest facility—and asset—supporting the development of technologies for human exploration is the International Space Station. The ISS allows NASA and the Agency's international partners to develop and test countermeasures, life-support technologies, and exploration capabilities over many months in the space environment. The ISS is currently the best analog for future human missions to the Moon and Mars.

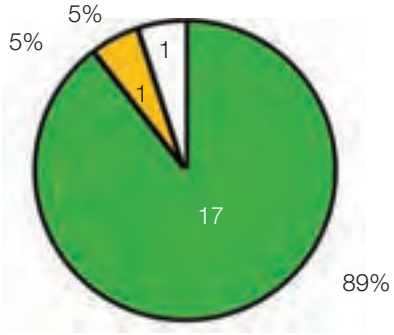
The cost of performance for Sub-goal 3F in FY 2006 was $367.07 million.

Outcome Ratings



Under Sub-goal 3F, NASA is on track to achieve all 3 Outcomes.

APG Ratings



Under Sub-goal 3F, NASA achieved 17 of 19 APGs.

Outcome 3F.1: By 2008, develop and test candidate countermeasures to ensure the health of humans traveling in space.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

With ever-increasing precision, NASA is developing countermeasures to assure the health of astronauts during long-duration missions. NASA is preparing for future exploration missions by conducting studies on bone loss, circulatory stress, drug interactions in space, behavioral health, microbial growth and virulence, and other areas. The Foot–Ground Reaction Forces experiment, concluded in April 2006, will help scientists understand the mechanics of bone mineral loss so they can create mechanical and pharmaceutical countermeasures. At the end of FY 2006, NASA had collected data from 18 subjects for the renal stone countermeasure experiment, and researchers expect to complete the experiment in March 2007. The data provided by this experiment will help NASA mitigate the occurrence of kidney stones while crewmembers are in space.

In addition to the deteriorating effects of microgravity, space poses several other challenges to astronauts, including the effects of space radiation on living organisms. In FY 2006, NASA scientists completed a study of high-energy, heavy particle radiation to identify the best ways to protect human crews. The results of the study will be published in FY 2007.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6SFS5 Green	Achieve a 5 percent reduction in downtime.	None	None	None
6SFS6 Green	Certify medical fitness of all crewmembers before launch.	5SFS20 Green	4SFS10 Green	None
6HSRT9 Yellow	Complete renal stone countermeasure development.	None	None	None
6HSRT10 Green	Start testing of bone and cardiovascular countermeasures in space.	None	None	None
6HSRT11 Green	Deliver report from National Council on Radiation Protection and Measurements on lunar radiation protection requirements.	None	None	None
6HSRT20 Green	Complete the physics database for shielding in the region above 2 GeV per nucleon.	None	None	None

Performance Shortfalls

6HSRT9: Although researchers made progress toward achieving this APG, the renal stone experiment will not be complete until data is collected on one more subject. NASA expects to complete the study in FY 2007.

Outcome 3F.2: By 2010, identify and test technologies to reduce total mission resource requirements for life support systems.

FY 2006	FY 2005	FY 2004	FY 2003
Green	Green	None	None

Current life support systems for space travel are large, heavy, and require considerable amounts of power that significantly increase the costs and resources needed for crewed missions. NASA is pursuing technologies to reduce the weight and resource demands of these systems. In FY 2006, NASA continued testing the Vapor Phase Catalytic Ammonia Removal Unit. This system will help convert human liquid wastes into drinkable water. NASA is conducting final verification of the ISS Fluids Integrated Rack and the Constrained Vapor Bubble Heat Exchanger to prepare them for launch to the ISS. NASA also is working on technologies for increasing carbon dioxide removal efficiency and converting recycled air into oxygen and water.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6HSRT13 Green	Start validation testing of a spacecraft water purification system called the Vapor Phase Catalytic Ammonia Removal Unit.	None	None	None
6HSRT14 White	Define requirements for the Condensing Heat Exchanger Flight experiment focused on improving space condenser reliability.	None	None	None
6HSRT15 Green	Complete and deliver for launch the ISS Fluids Integrated Rack.	None	None	None
6HSRT16 Green	Complete and deliver for launch experiments to explore new lightweight heat rejection technologies.	None	None	None
6HSRT17 Green	Start technology testing and assessment of the Solid Waste Compaction processor.	None	None	None
6HSRT18 Green	Conduct next-generation lithium hydroxide (LiOH) packaging tests to improve carbon dioxide removal efficiency.	None	None	None

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6HSRT19 Green	Conduct ground testing of the Sabatier unit to demonstrate reliability in recovering oxygen and water from carbon dioxide.	None	None	None

Performance Shortfalls

6HSRT14: NASA canceled the Condensing Heat Exchanger Flight experiment.

Outcome 3F.3: By 2010, develop reliable spacecraft technologies for advanced environmental monitoring and control and fire safety.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

Fires, air quality, and environmental monitoring are significant challenges in the high oxygen environment and close quarters of a spacecraft. To mitigate these risks, NASA is developing technologies to monitor cabin air quality and water quality and to improve ways to detect and extinguish fires. Technologies under development in FY 2006 included the Vehicle Cabin Air Monitoring System, a hand-held water monitoring system, and advanced smoke detection tools using data from the Dust and Aerosol Measurement Feasibility Tests experiment flown on the ISS. In addition, the Droplet Flame Extinguishment Experiment and the ISS Combustion Integrated Rack are undergoing final verification for flight and installation on the ISS. This equipment will enable further combustion and fire suppression experiments in microgravity.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6HSRT3 Green	Demonstrate the ability of the advanced spacecraft air monitoring system to detect 90 percent of the high-priority air contaminants in ground testing.	None	None	None
6HSRT4 Green	Demonstrate the ability of the hand-held water monitoring system to detect spacecraft water biocides and high-priority metal contaminants in ground testing.	None	None	None
6HSRT5 Green	Support development of a new generation of reliable spacecraft smoke detectors by finishing measurements of ISS background particulates using the DAFT experiment and delivering for launch the Smoke and Aerosol Measurement Experiment (SAME).	None	None	None
6HSRT6 Green	Complete and deliver for launch the ISS Combustion Integrated Rack (CIR).	None	None	None
6HSRT7 Green	Complete and deliver for launch the Droplet Flame Extinguishment in Microgravity Experiment aimed at quantifying fire suppressant effectiveness.	None	None	None
6HSRT8 Green	Develop a revised space materials flammability characterization test method and update NASA-STD-6001 accordingly.	None	None	None

Strategic Goal 4 *Bring a new Crew Exploration Vehicle into service as soon as possible after Shuttle retirement.*

With the Space Shuttle's retirement scheduled for 2010, NASA must develop a next-generation space transportation system to deliver crew and cargo to the International Space Station (ISS). Unlike the Shuttle, the new Constellation System vehicles will travel beyond low Earth orbit to return humans to the Moon and eventually carry them to Mars and beyond.

The first vehicles in the Constellation System will be the Orion Crew Exploration Vehicle (CEV) and the Ares I Crew Launch Vehicle (CLV). The Orion CEV will use reliable elements from the Apollo and Shuttle systems, but it also will incorporate the latest in shielding, computer technologies, and support systems. The Ares I CLV also will leverage existing technologies and systems to provide an affordable, reliable, and safe method for launching humans and cargo into orbit. To launch the new vehicles beyond low Earth orbit, NASA is developing the Ares V heavy lift launcher. It will have capabilities similar to the Saturn V rocket used for the Apollo missions.

In this artist's concept, the Orion Crew Exploration Vehicle approaches the International Space Station. (NASA)

NASA's goal is to have the Orion CEV and Ares I CLV operational as close to 2010 as possible, but no later than 2014.

Risks to Achieving Strategic Goal 4

Potential risks to the successful completion of the Orion CEV/Ares I CLV space transportation system include workforce and asset transitioning and given that NASA has not developed a new lunar spacecraft in over 30 years, unexpected technical hurdles. In FY 2007, NASA will begin transitioning workforce and assets from the Space Shuttle Program to the Constellation Systems Program. To mitigate the risks associated with this major transition, the Agency will use a number of working groups and control boards, including the Transition Control Board, the Joint Integration Control Board, and the Headquarters Transition Working Group, to coordinate actions across programs.

Assessments

In FY 2006, the Office of Management and Budget (OMB) assessed the Constellation Systems Program with OMB's Program Assessment Rating Tool (PART). OMB assessed the overall program as "Adequate," with the following scores by program section:

Kennedy Space Center Prepares for Constellation Systems

The Kennedy Space Center will support NASA's new Constellation Systems by using existing assets that support the Space Shuttle Program. NASA initiated an effort to support construction, alteration, renovation, and repair of buildings and structures that will form the Constellation Systems processing and launch infrastructure. Early concepts include using assets like the Shuttle Crawler Transporter to meet Ares I/Orion vehicle ground support requirements. The Kennedy Space Center and the State of Florida entered into a Space Act Agreement to conduct studies on assembly and checkout facilities and the preparation of a high bay for these activities.

Right: An early concept drawing shows the CLV being transported to the Pad on the modified Shuttle Crawler Transporter following stacking operations in the Vehicle Assembly Building. (NASA)

- Program Purpose and Design—100%
- Strategic Planning—78%
- Program Management—75%
- Program Results/Accountability—40%

OMB cited a major deficiency in the Program Management area for the Constellation Systems Program related to Agency-wide problems with integrating NASA's new systems for financial and administrative management. The lower scores in the Program Results/Accountability and Strategic Planning areas were due to the relative newness of the program and the limited baselines for comparison and evaluation.

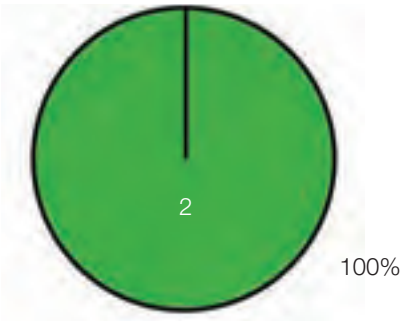
Resources, Facilities, and Major Assets

Some of the major facilities supporting Constellation Systems Program activities include the following:

- The Johnson Space Center is managing the CEV project. Johnson also manages astronaut training, so NASA is constructing training mock-ups of the CEV crew module and other elements in Johnson's Mock-up Facility.
- The Stennis Space Center will test the J–2X engine that will power the upper stage of Ares I and the Earth-departure stage of the Ares V cargo launch vehicle. During FY 2007, NASA will decommission the A-1 Test Stand that has been used to test Shuttle engines since 1975 and convert it for testing the J–2X engine. In the future, NASA will test the RS-68 rocket that will power the Ares V's main stage at Stennis's B-1 Test Stand.
- The Glenn Research Center will test the J–2X engine in its Cryogenic Propellant Tank Facility, which simulates the extreme cold and vacuum of space.
- The Langley Research Center will characterize the aerodynamics of the Orion CEV in the Center's wind tunnel facilities.
- The Michoud Assembly Facility, which currently builds external tanks for the Shuttle, will assemble the Ares upper stages.
- The Kennedy Space Center will manage launch operations. Over the next several years, NASA will transition Kennedy's Shuttle facilities and build new facilities to serve the future needs of the Constellation Systems Program.

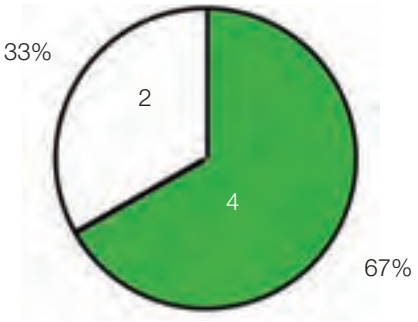
The cost of performance for Strategic Goal 4 in FY 2006 was $1,622.16 million.

Outcome Ratings



Under Strategic Goal 4, NASA is on track to achieve both Outcomes.

APG Ratings



Under Strategic Goal 4, NASA achieved 4 of 6 APGs.

Outcome 4.1: No later than 2014, and as early as 2010, transport three crewmembers to the International Space Station and return them safely to Earth, demonstrating an operational capability to support human exploration missions.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

NASA is making progress on the development of the Orion CEV and Ares I CLV. During FY 2006, NASA awarded contracts to Alliant Techsystems and Pratt & Whitney Rocketdyne for Ares I first stage and upper stage engine development, respectively. NASA engineers conducted over 80 wind tunnel tests on a partial model of the Ares I vehicle that included a portion of the upper stage, the spacecraft adapter, the Orion CEV, and the launch abort system. Data collected during these tests will help engineers modify the system's aerodynamics to maximize the vehicle's flight capabilities. The Agency also completed preliminary tests of an "augmented spark igniter" for Ares I. This vital component acts as the rocket's "spark plug," igniting the liquid hydrogen and liquid oxygen propellants needed to power the spacecraft.

This artist's concept drawing shows the Ares V heavy lift cargo launch vehicle (left) and the Ares I crew launch vehicle (right). (NASA)

On August 31, NASA named Lockheed Martin as the primary contractor to help the Agency design, develop, test, and certify the Orion CEV.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6CS1 Green	Conduct the Earth Orbit Capability (Spiral 1) Systems Requirements Review to define detailed interface requirements for the Crew Exploration Vehicle, the Crew Launch Vehicle, and supporting ground and in-space systems.	5TS1 Green	None	None
6CS2 Green	Competitively award contract(s) for Phase A and Phase B design and flight demonstration of the Crew Exploration Vehicle.	None	None	None
6CS3 Green	Develop detailed Crew Launch Vehicle design and operational modifications to support human rating and exploration mission architecture requirements.	5TS3 Green	None	None
6CS4 Green	Develop a plan for systems engineering and integration of the exploration System of Systems; clearly defining systems and organizational interfaces, management processes, and implementation plans.	None	None	None

Outcome 4.2: No later than 2014, and as early as 2010, develop and deploy a new space suit to support exploration, that will be used in the initial operating capability of the Crew Exploration Vehicle.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

NASA is redefining the Extravehicular Activity Systems (i.e., spacesuits and other equipment) for the Constellation Systems Program due to evolving budget priorities. During FY 2006, the Constellation Systems Program re-evaluated the requirements driving spacesuit design and determined that instead of developing two spacesuits—one for use in space and one for use on the lunar surface—the Constellation Systems Program will develop a single, integrated spacesuit. The spacesuit design also will incorporate maximum design flexibility and modularity to allow for the efficient integration of upgrades. This approach should reduce the development costs of this project.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6HSRT1 White	Complete the technology trade studies for both the in-space and surface EVA suits.	None	None	None

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6HSRT2 White	Complete the system requirements review for both the in-space and surface exploration EVA suits.	None	None	None

Performance Shortfalls

6HSRT1 and 6HSRT2: Due to changes in the Extravehicular Activity Systems architecture, NASA management canceled these APGs. NASA will include appropriately revised APGs in the FY 2007 Performance Plan.

Strategic Goal 5 *Encourage the pursuit of appropriate partnerships with the emerging commercial space sector.*

The landscape of the space industry is changing. The recent award of the Ansari X–Prize and other ongoing private space efforts has strengthened the potential for the commercial space sector to expand into new markets. NASA is collaborating with established commercial launch service providers while also encouraging development of the emerging entrepreneurial launch sector through incentives like Space Act Agreements and prize competitions. Through these partnerships, NASA will gain access to a wider selection of competitively priced technology, services, and capabilities.

In FY 2006, NASA signed Space Act Agreements with SpaceX and Rocketplane–Kistler to design vehicle options for delivering cargo to the International Space Station. This picture shows artist renditions of SpaceX's Dragon cargo and crew elements (top) and Rocketplane Kistler's orbital vehicle. (NASA)

Risks to Achieving Strategic Goal 5

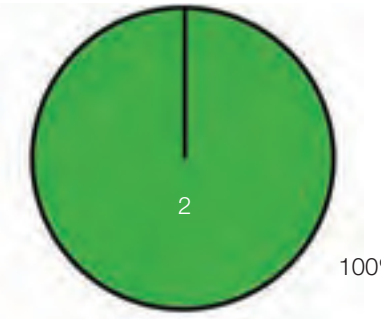
NASA payloads are often one-of-a-kind, complex, and expensive, so it is imperative that NASA take all reasonable measures to assure successful launches. The greatest challenges associated with Strategic Goal 5 are finding emerging companies that can demonstrate the required launch capabilities and mitigating additional risk associated with using less experienced commercial launch providers. NASA's Commercial Orbital Transportation Services (COTS) project reflects the Agency's goal of acquiring launch services from emerging launch providers to free up government resources for projects like the Orion Crew Exploration Vehicle.

Resources, Facilities, and Major Assets

NASA currently does not use any of the Agency's major facilities to support activities contributing to Strategic Goal 5. However, NASA does make available to the Agency's commercial partners many of the Agency's world-class facilities, like rocket propulsion test stands and wind tunnels, so they can test developmental technologies. The major assets supporting Strategic Goal 5 are NASA's workforce managing the Commercial Crew and Cargo Program Office at Johnson Space Center and the Agency's many industry partners.

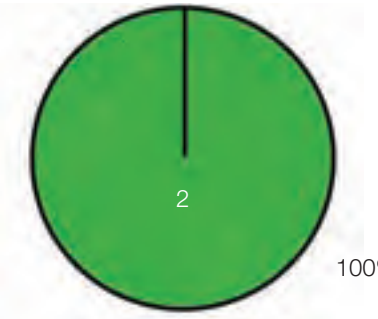
The cost of performance for Strategic Goal 5 in FY 2006 was $44.00 million.

Outcome Ratings



Under Strategic Goal 5, NASA is on track to achieve both Outcomes.

APG Ratings



Under Strategic Goal 5, NASA achieved both APGs.

Outcome 5.1: Develop and demonstrate a means for NASA to purchase launch services from emerging launch providers.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

During FY 2006, NASA established the Commercial Crew and Cargo Program Office at the Johnson Space Center to manage NASA's COTS project. NASA will pursue commercial partnerships with private industries through COTS to develop and demonstrate the vehicles, systems, and operations needed to transport cargo and crew to and from the International Space Station (ISS).

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6SFS4 Green	Define and provide space transportation requirements for future human and robotic exploration and development of space to all NASA and other government agency programs pursuing improvements in space transportation.	5SFS19 Green	None	None

Outcome 5.2: By 2010, demonstrate one or more commercial space services for ISS cargo and/or crew transport.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

In FY 2006, NASA signed Space Act Agreements with SpaceX and Rocketplane–Kistler stating that the two companies would develop reliable, cost-effective options for delivering cargo to the ISS as defined by NASA in the COTS Service Requirements Document. As a first step, NASA and these new Agency partners agreed on scheduled milestones, including demonstrations of the vehicles as early as 2008 through 2010. NASA will continue to work closely with these companies to develop their launch capabilities.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6ISS2 Green	Downselect transportation service providers from FY 2005 ISS Cargo Acquisition RFP.	5ISS7 Yellow	None	None

Strategic Goal 6 *Establish a lunar return program having the maximum possible utility for later missions to Mars and other destinations.*

Missions to the Moon in the 21st century will be vastly different from the Apollo missions. Future missions will carry more crewmembers, expand the range of lunar landing sites, and increase the length of time astronauts spend exploring the lunar surface. Future explorers also will experiment with using lunar resources (e.g., possible water ice located deep within lunar craters) to reduce the amount of supplies that must be brought from Earth and to support an extended human presence on the Moon.

To achieve Strategic Goal 6, NASA will leverage partnerships with industry and the international space community to acquire next-generation technologies for life support, communications and navigation, radiation shielding, power generation and storage, propulsion, and resource extraction and processing.

In FY 2006, NASA began laying the foundation for the lunar return program by focusing Agency research on robotic reconnaissance explorers, surface nuclear power systems, and advanced communications systems. These technologies will support the lunar return program and will evolve and be adapted to support future Mars missions.

In November 2005, Johnson Space Center's Robonaut (foreground) performs a mock weld while Ames Research Center's K10 robot assists two spacesuited crewmembers inspecting a previously welded seam. This activity tested human–robot interactions and the two robots' ability to work together autonomously for assembly and maintenance, important capabilities for future lunar exploration. (NASA)

Risks to Achieving Strategic Goal 6

NASA faces a myriad of technological challenges and risks in returning humans to the Moon. Every system, from the Constellation Systems that will transport humans to the Moon to the surface nuclear power systems that will power lunar outposts, will need to work seamlessly, reliably, and have back-up capabilities to assure the safety of lunar crews. Like all research and development work, these initiatives will confront technological challenges and unpredictable breakthroughs that could interfere with project schedules and increase development costs. NASA will adjust schedules and cost estimates as the projects progress.

Resources, Facilities, and Major Assets

NASA will test components of the Lunar Reconnaissance Orbiter (LRO) in the Goddard Space Flight Center's Thermal Vacuum Chamber, which simulates the harsh space environment. After development and extensive testing, engineers at the Kennedy Space Center will prepare the LRO and the Lunar Crater Observation and Sensing Satellite (LCROSS) for launch.

NASA is using several Agency laboratories and facilities to conduct research contributing to Outcome 6.2:

- The Ames Research Center's Intelligent Systems Division develops software and engineering systems to make rovers, robots, and autonomous vehicles more adaptable, robust, and capable. The intelligent systems designed at Ames will play an integral role in robotic precursor missions and in creating robotic assistants for human explorers.
- NASA will test large systems at the Johnson Space Center's two Large Thermal Vacuum Chambers, which can simulate the lunar pole environment. Johnson's Automation, Robotics, and Simulation Division will integrate robotic systems into test technologies for analysis, testing, and verification at Johnson's various laboratories.

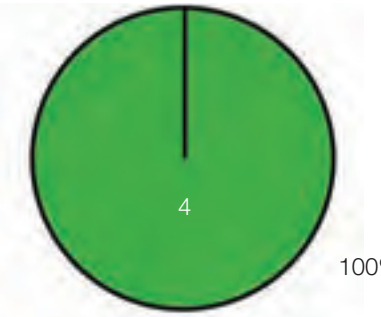
- The Glenn Research Center's Aerospace Flight Battery System Program will develop improved batteries to support in-space and surface operations.

NASA is conducting most of the work for the Prometheus Power and Propulsion project contributing to Outcome 6.3 at the Glenn Research Center and Marshall Space Flight Center. NASA will use Glenn's Solar Thermal Vacuum Facility–Tank 6, which can simulate a range of space environments, to develop the Technology Demonstration Unit, used to study and resolve system integration issues. NASA then will use Marshall's Early Flight Fission Test Facility to test the reactor simulator portion of the Technology Demonstration Unit. The Early Flight Fission Test Facility allows engineers to test aspects of nuclear reactors under non-nuclear conditions.

NASA's extensive communications networks are anchored by four major elements: the Tracking and Data Relay Satellite (TDRS) system, a constellation of satellites that provide in-flight communications with spacecraft operating in low Earth orbit; the Space Network complexes that relay data from TDRS; the NASA Integrated Services Network, which enables communications between all Agency locations; and the Deep Space Network, an international network of antennas that support NASA's Earth-orbiting and interplanetary missions. The Space Operations Mission Directorate's Space Communications Program is developing a new space communications architecture that will support the Agency's exploration and science missions through 2030, as specified under Outcome 6.4.

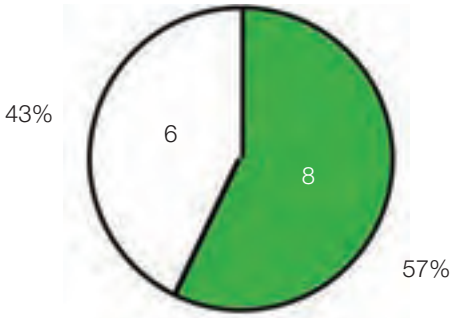
The cost of performance for Strategic Goal 6 in FY 2006 was $665.26 million.

Outcome Ratings



Under Strategic Goal 6, NASA is on track to achieve all 4 Outcomes.

APG Ratings



Under Strategic Goal 6, NASA achieved 8 of 14 APGs.

Outcome 6.1: By 2008, launch a Lunar Reconnaissance Orbiter (LRO) that will provide information about potential human exploration sites.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

NASA's LRO mission, to be launched in 2008, will map the lunar surface to identify optimal landing sites, search for potential resources, and characterize surface radiation levels. LRO's laser altimeter will be able to peer into permanently shadowed craters at the lunar poles to map terrain while the Lunar Exploration Neutron Detector (LEND), an instrument that detects chemical signatures, and Diviner Lunar Radiometer Experiment, which maps the lunar surface temperature, search for evidence of polar ice. Craters on the lunar poles are particularly important for exploration due to the possible presence of water ice.

Additional LRO capabilities include the following:

- Provide a Digital Elevation Model (DEM), accurate to one meter vertically and 50 meters horizontally. The DEM also will provide the local slope, necessary for safe landing;

- Acquire high-resolution photographs (better than one-meter resolution) of potential landing sites, which NASA will assess for hazards and changing lighting conditions;
- Characterize the terrain, including surface roughness and rock abundance using the laser altimeter or reflected ultraviolet light;
- Characterize potential resources and lighting conditions, necessary to control the effectiveness and utility of solar power systems; and
- Support the assessment of biological risks from radiation levels.

In this artist's impression, the Shepherding Spacecraft waits in the foreground while the Centaur heads toward the Moon's south polar region. (NASA)

During FY 2006, NASA completed the mission's preliminary design review. In July, NASA awarded a launch services contract for LRO to Lockheed Martin Commercial Launch Services, Inc. LRO will launch aboard a Lockheed Martin Atlas V rocket in late 2008.

In September 2006, NASA began the program design review for the LCROSS mission that will fly with LRO. As LCROSS approaches the Moon's south polar region, it will split into two vehicles: the Shepherding Spacecraft and the Centaur Upper Stage. Centaur will impact a crater in the south polar region, sending up a plume of debris. The Shepherding Spacecraft will fly through the plume, and instruments on the spacecraft will analyze the cloud to look for signs of water and other compounds.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6SSE1 Green	Complete Lunar Reconnaissance Orbiter (LRO) Preliminary Design Review (PDR).	None	None	None

Outcome 6.2: By 2012, develop and test technologies for in-situ resource utilization, power generation, and autonomous systems that reduce consumables launched from Earth and moderate mission risk.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

NASA is developing the necessary tools, technologies, and capabilities to support the Agency's lunar return program: producing oxygen from lunar soil, creating advanced rovers for surface mobility, advancing concepts for cryogenic propellant storage, developing propulsion systems that use propellants created from lunar surface resources, and improving radiation-hardened microelectronics to reduce mission risk.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6ESRT1 Green	Identify and test technologies to enable affordable pre-positioning of logistics for human exploration missions. Technology development includes high-power electric thrusters and high efficiency solar arrays for solar electric transfer vehicles, and lightweight composite cryotanks and zero boil-off thermal management for in-space propellant depots.	None	None	None
6ESRT2 White	Identify and test technologies to enable in-space assembly, maintenance, and servicing. Technology development includes modular truss structures, docking mechanisms, micro-spacecraft inspector, intelligent robotic manipulators, and advanced software approaches for telerobotic operations.	None	None	None
6ESRT3 Green	Identify and test technologies to reduce mission risk for critical vehicle systems, supporting infrastructure, and mission operations. Technology development includes reconfigurable and radiation tolerant computers, robust electronics for extreme environments, reliable software, and intelligent systems health management.	None	None	None

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6ESRT4 Green	Design and test technologies for in situ resource utilization that can enable more affordable and reliable space exploration by reducing required launch mass from Earth, and by reducing risks associated with logistics chains that supply consumables and other materials. Technology development includes excavation systems, volatile material extraction systems, and subsystems supporting lunar oxygen and propellant production plants.	None	None	None
6ESRT5 White	Validate the ESMD research and technology development needs and opportunities by implementing a Quality Function Deployment process, and use the results to guide ESR&T program investment decisions.	None	None	None
6ESRT6 Green	Develop and analyze affordable architectures for human and robotic exploration system and mission options using innovative approaches such as modular systems, in-space assembly, pre-positioning of logistics, and utilization of in-situ resources.	None	None	None
6ESRT7 White	Identify and define technology flight experiment opportunities to validate the performance of critical technologies for exploration missions.	None	None	None
6ESRT8 Green	Identify and test technologies to reduce the costs of mission operations. Technology development includes autonomous and intelligent systems, human–automation interaction, multi-agent teaming, and space communications and networking.	None	None	None

Performance Shortfalls

6ESRT2, 6ESRT5, and 6ERT7: NASA canceled all work related to in-space assembly (6ESRT2) and the In-space Technology Experiments (InSTEP) project (6ESRT7). NASA also decided that the Quality Function Deployment Process was no longer needed.

Outcome 6.3: By 2010, identify and conduct long-term research necessary to develop nuclear technologies essential to support human–robotic lunar missions and that are extensible to exploration of Mars.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

During FY 2006, NASA reformulated the Prometheus Power and Propulsion Program to better align it with the Vision for Space Exploration and available Agency resources by focusing the program on surface nuclear power system development. Therefore, most of the program's FY 2006 activities revolved around closing out nuclear electric propulsion efforts. In addition, program staff began reformulating program objectives and reviewed lessons learned and various studies to aid them in transitioning to a long-term research and technology program. NASA and U.S. Department of Energy (DoE) power experts began the Affordable Fission Surface Power System Study. NASA anticipates a report in mid-FY 2007.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6PROM1 White	Following completion of the Prometheus Analysis of Alternatives, complete space nuclear reactor conceptual design.	None	None	None
6PROM2 White	Verify and validate the minimum functionality of initial nuclear electric propulsion (NEP) spacecraft capability.	None	None	None
6PROM3 White	Complete component level tests and assessments of advanced power conversion systems.	None	None	None

Performance Shortfalls

6PROM1, 6PROM2, and 6PROM3: NASA canceled these APGs due to a program focus shift from nuclear electric propulsion development to surface nuclear power systems development. NASA will provide appropriately revised APGs for Outcome 6.3 in the FY 2007 Performance Plan Update to accompany the Agency's FY 2008 Budget Estimates. Meanwhile, the Prometheus project will continue work toward achieving Outcome 6.3 on schedule.

Outcome 6.4: Implement the space communications and navigation architecture responsive to Science and Exploration mission requirements.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

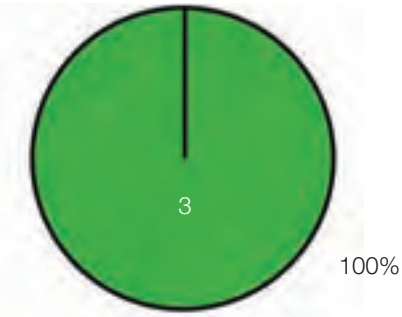
NASA is developing a Space Communications Architecture that will provide the necessary communication and navigation services for the Agency's space exploration and science missions through 2030. This architecture will provide communication services to space missions operating anywhere in the solar system and will feature clustered networking services at Earth, the Moon, and Mars to provide faster, more reliable communication connections. In March 2006, the Space Communications Architecture Working Group presented the proposed architecture, including details about network connections, security protocols, radio frequency-spectrum allocations, and navigation support functions, to the Agency's Strategic Management Council. Agency management is reviewing the implementation plans for this architecture that NASA expects to have operational by 2014.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6SFS1 Green	Establish the Agency-wide baseline space communications architecture, including a framework for possible deep space and near Earth laser communications services.	5SFS8 Green	4SFS8 Green	None
6SFS3 Green	Achieve at least 95 percent of planned data delivery for the International Space Station, each Space Shuttle mission, and low Earth orbiting missions for FY 2006.	5SFS16 Blue	4SFS5 Blue	3H14 Blue

Cross-Agency Support Programs

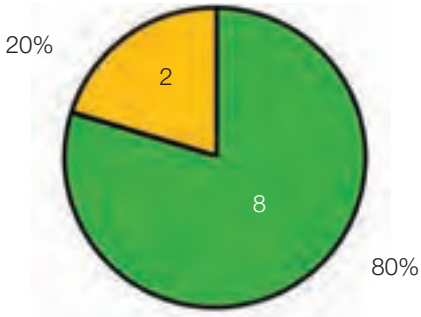
NASA created Cross-Agency Support Programs—introduced in the FY 2007 Budget Estimates and included in the FY 2006 Performance Plan, reported on in this document—to focus on several ongoing activities that function across all Mission Directorates and Mission Support Areas to serve NASA's Mission and to establish an improved way of managing NASA's unique facilities.

Outcome Ratings



Under Cross-Agency Support Programs, NASA is on track to achieve all 3 Outcomes.

APG Ratings



Under Cross-Agency Support Programs, NASA achieved 8 of 10 APGs.

Education

Achieving the Vision for Space Exploration will require a workforce that is equipped with the skills and capabilities necessary to meet future mission needs. In the near-term, NASA will meet these needs by training current employees and bringing new employees with new capabilities into the Agency. To meet long-term needs, NASA's Education programs will help create the workforce of the future by inspiring students at all levels to pursue careers in science, technology, engineering, and mathematics (STEM), providing professional-development opportunities to STEM teachers, and developing interesting STEM content for the classroom, the Web, and informal learning environments like museums and community-based organizations.

A young explorer builds a rocket at Astro Camp hosted by the Stennis Space Center. NASA's Centers hold events, provide education opportunities, and develop projects that help NASA's Education programs achieve their objectives. (NASA)

Outcome ED–1: Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's Strategic Goals through a portfolio of programs.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

In FY 2006, NASA redesigned the Agency's Education programs to maximize returns on education investments. NASA awarded over 10,000 competitive scholarships, fellowships, and research opportunities for graduates, undergraduates, underprivileged students, and faculty in STEM disciplines. The Agency uses these scholarships, fellowships, and research opportunities to build student interest in NASA and to increase partnerships with informal and formal education providers. Education program managers now are tracking students who receive scholarships or fellowships to determine their level of involvement with NASA after their formal education is complete. This tracking initiative also will help identify opportunities for improving the Agency's education programs.

To provide a historical base and additional lessons learned, NASA also is planning a retrospective survey of current employees who participated in NASA education programs.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6ED3 Green	Award approximately 1,000 competitive scholarships, fellowships, and research opportunities for higher education students and faculty in STEM disciplines. (APG revised: awards reduced from 1,500 to 1,000 based on FY 2006 Appropriation.)	None	None	None
6ED4 Yellow	Complete a retrospective longitudinal study of student participants to determine the degree to which participants entered the NASA workforce or other NASA-related career fields.	None	None	None
6ED5 Green	Collect, analyze, and report longitudinal data on student participants to determine the degree to which participants enter the NASA workforce or other NASA-related career fields.	None	None	None
6ED6 Green	Award approximately 250 competitive scholarships, internships, fellowships, and research opportunities for underrepresented and underserved students, teachers, and faculty in STEM disciplines. (APG revised: awards reduced from 1,100 to 250 based on FY 2006 Appropriation.)	None	None	None
6ED7 Yellow	Provide approximately 50 grants to enhance the capability of approximately 25 underrepresented and underserved colleges and universities to compete for and conduct basic or applied NASA-related research. (APG revised: grants reduced from 350 to 50, and the number of colleges and universities awarded reduced from 100 to 25, based on FY 2006 Appropriation.)	None	None	None

Performance Shortfalls

6ED4: NASA did not complete the retrospective study of student participants' entry into the NASA workforce, because the number of employees hired within the past decade was higher than expected. NASA will complete the survey in FY 2007.

6ED7: NASA exceeded the number of institutions during FY 2006, but did not achieve the targeted number of grant awards.

Advanced Business Systems (Integrated Enterprise Management Program)

NASA's Integrated Enterprise Management Program (IEMP) is transforming the Agency's business systems, processes, and procedures to improve financial management and accountability and to increase efficiency and cost savings across the Agency. IEMP projects currently underway include the following:

- eTravel, which will replace NASA's Travel Manager system with an end-to-end travel management system;
- The Contract Management Module, which will provide a comprehensive tool to support contract writing, contract administration, procurement workload management, and data reporting/management for NASA;
- The Human Capital Information Environment, which will provide online access to near real-time human capital information;
- The Integrated Asset Management, Property, Plant, and Equipment module, which will focus on the accountability, valuation, and tracking of internal-use software, Theme assets, and personal property that is either NASA-owned/NASA-held or NASA-owned/contractor-held;
- The SAP Version Update to enhance the Agency's Core Financial system functionality; and
- The Aircraft Management Module, which will provide an integrated toolset that will enhance the management and oversight of NASA's mission management aircraft, mission support aircraft, and research aircraft.

Assessments

In FY 2006, the Office of Management and Budget (OMB) rated IEMP as "Moderately Effective" using the Program Assessment Rating Tool (PART). IEMP received the following scores in the four PART assessment areas:

- Program Purpose and Design—80% (moderately effective)
- Strategic Planning—100% (effective)
- Program Management—88% (effective)
- Program Results/Accountability—67% (adequate)

The scores indicate that NASA has set valid annual and long-term goals for IEMP and established effective processes for program management and financial oversight. However, the Agency should revise some of the accountability processes to ensure consistent program effectiveness.

Outcome IEM–2: Increase efficiency by implementing new business systems and reengineering Agency business processes.

FY 2006	FY 2005	FY 2004	FY 2003
Green	None	None	None

Major FY 2006 efforts for IEMP include the Project Management Information Improvement (PMII) project and the Agency Labor Distribution System (ALDS). The PMII Project enhanced the Core Financial system by implementing policy adjustments and mapping data between financial structures and technical work breakdown structures. The PMII project also improved the transmission of cost reporting information to project managers. NASA used ALDS to replace legacy Center labor distribution systems with an Agency labor distribution system and standardized processes based on new policies and procedures approved by NASA's Chief Financial Officer.

FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6IEM1 Green	Deliver an analysis and recommendations for long-term solutions to account for and maintain the Agency's assets defined as Property Plant & Equipment and Operating Materials and Supplies (encompasses the major functions of Environmental, Facilities, Logistics, and all related financial activities).	None	None	None

Innovative Partnerships Program

To achieve the Vision for Space Exploration in an affordable and sustainable manner, NASA partners with industry and academia to leverage outside investments and expertise while giving the Agency's partners an economic incentive to invest in NASA programs. NASA's Innovative Partnerships Program (IPP) attracts and maintains Agency business partnerships and manages both intellectual property rights and technology transfer processes.

IPP serves all four Mission Directorates across NASA's 10 Centers. Mission Directorates outline their technology needs, and IPP helps satisfy those needs through research and development partnerships with industry and academia, technology transfer with non-profit research institutions like universities, and commercialization opportunities to help entrepreneurs develop NASA technologies for the marketplace.

NASA's IPP managers spent much of FY 2006 examining precedents and establishing protocols that will help the Agency partner with emerging space industry businesses.

Outcome IPP–1: Promote and develop innovative technology partnerships among NASA, U.S. industry, and other sectors for the benefit of Agency programs and projects.

FY 2006	FY 2005	FY 2004	FY 2003
Green	Green	Blue	None

In FY 2006, IPP established the Seed Fund Initiative. This initiative will enhance NASA's ability to meet mission technology goals by providing "bridge" funding between NASA and the Agency's partners. This initiative also will make programs more affordable by funding partnerships in which all parties involved share the costs, risks, benefits, and outcomes.

NASA also formed a partnership with Red Planet Capital, Inc., to help advance the Agency's technological position through the venture capital community. Through this contract, NASA has established a strategic venture capital fund to promote the future availability of technologies with government and commercial applications that meet future mission requirements.

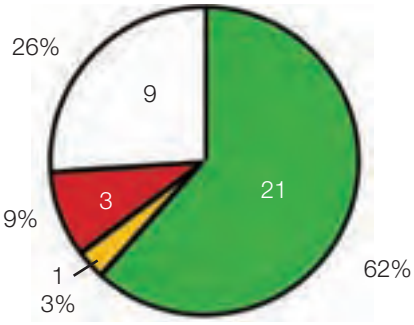
FY 2006 Annual Performance Goal		FY 2005	FY 2004	FY 2003
6ESRT9 Green	Complete 50 technology transfer agreements with the U.S. private sector for transfer of NASA technologies, hardware licenses, software usage agreements, facility usage agreements, or Space Act Agreements.	5HRT18 Green	4HRT6 Green	None
6ESRT10 Green	Develop 40 industry partnerships that will add value to NASA missions.	5HRT13 Green	4HRT9 Blue	None
6ESRT11 Green	Establish at least twelve new partnerships with major ESMD R&D programs or other NASA organizations.	None	None	None
6ESRT12 Green	Award Phase III contracts or venture capital funds to 4 SBIR firms to further develop or produce technology for U.S. industry or government agencies.	5HRT14 Green	4HRT10 Green	None

Efficiency Measures

NASA uses the Agency's Strategic Goals, multi-year Outcomes, and Annual Performance Goals (APGS) to measure performance progress in program areas. NASA also uses Efficiency Measure APGs to track the Agency's performance in a number of management areas, including cost, schedule, and project completion.

NASA organizes the Efficiency Measure APGs by budget Theme to emphasize and encourage individual program accountability. The following table documents the Agency's performance against these metrics for FY 2006.

APG Ratings



Under Efficiency Measures, NASA achieved 21 of 34 APGs.

FY 2006 Performance Measure		FY 2005	FY 2004	FY 2003
Aeronautics Technology				
6AT12 Green	Deliver at least 90% of scheduled operating hours for all operations and research facilities.	None	None	None
6AT13 Green	Increase the annual percentage of research funding subject to external peer review prior to award.	None	None	None
Education				
6ED11 Green	Collect, analyze, and report the percentage of grantees that annually report on their accomplishments.	None	None	None
6ED12 Red	Peer review and competitively award at least 80%, by budget, of research projects.	5ED19 Green	4ED24 Green	None
Constellation Systems				
6CS5 Green	Complete all development projects within 110% of the cost and schedule baseline.	None	None	None
6CS6 Green	Increase annually the percentage of ESR&T and HSR&T technologies transitioned to Constellation Systems programs.	None	None	None
Exploration Systems Research and Technology				
6ESRT13 White	Complete all development projects within 110% of the cost and schedule baseline.	None	None	None
6PROM4 White	Complete all development projects within 110% of the cost and schedule baseline.	None	None	None
6ESRT14 White	Peer review and competitively award at least 80%, by budget, of research projects.	5HRT15 Green	4HRT13 Green	None
6ESRT15 White	Reduce annually, the time to award competed projects, from proposal receipt to selection.	None	None	None
6PROM5 White	Reduce annually, the time to award competed projects, from proposal receipt to selection.	None	None	None
Human Systems Research and Technology				
6HSRT21 Green	Deliver at least 90% of scheduled operating hours for all operations and research facilities.	5BSR19 Green	4RPFS11 Green	None
6HSRT22 White	Increase annually, the percentage of grants awarded on a competitive basis.	None	None	None
6HSRT23 Green	Peer review and competitively award at least 80%, by budget, of research projects.	5BSR20 Green	4BSR19 4PSR11 Green	None
6HSRT247 Green	Reduce time within which 80% of NRA research grants are awarded, from proposal due date to selection, by 5% per year, with a goal of 130 days.	None	None	None

FY 2006 Performance Measure		FY 2005	FY 2004	FY 2003
Earth–Sun System				
6ESS24 Red	Complete all development projects within 110% of the cost and schedule baseline.	5SEC14 Red	4ESS1 Green	None
6ESS25 Green	Deliver at least 90% of scheduled operating hours for all operations and research facilities.	5SEC15 Yellow	None	None
6ESS26 Green	Peer-review and competitively award at least 80%, by budget, of research projects.	5SEC16 Green	4ESA8 Green	None
6ESS27 Green	Reduce time within which 80% of NRA research grants are awarded, from proposal due date to selection, by 5% per year, with a goal of 130 days.	None	None	None
Solar System Exploration				
6SSE29 Red	Complete all development projects within 110% of the cost and schedule baseline.	5SSE15 Yellow	4SSE1 Yellow	None
6SSE30 Green	Deliver at least 90% of scheduled operating hours for all operations and research facilities.	5SSE16 Green	None	None
6SSE31 Green	Peer-review and competitively award at least 80%, by budget, of research projects.	5SSE17 Green	4SSE2 Green	None
6SSE32 Green	Reduce time within which 80% of NRA research grants are awarded, from proposal due date to selection, by 5% per year, with a goal of 130 days.	None	None	None
The Universe				
6UNIV22 White	Complete all development projects within 110% of the cost and schedule baseline.	5ASO13 Green	4ASO1 White	None
6UNIV23 Green	Deliver at least 90% of scheduled operating hours for all operations and research facilities.	5ASO14 Yellow	None	None
6UNIV24 Green	Peer-review and competitively award at least 80%, by budget, of research projects.	5ASO15 Green	4SEU2 4ASO2 Green	None
6UNIV25 Yellow	Reduce time within which 80% of NRA research grants are awarded, from proposal due date to selection, by 5% per year, with a goal of 130 days.	None	None	None
International Space Station				
6ISS5 Green	Complete all development projects within 110% of the cost and schedule baseline.	5ISS8 Green	4ISS7 Green	None
6ISS6 Green	Deliver at least 90% of scheduled operating hours for all operations and research facilities.	5ISS9 Green	None	None
Space Flight Support				
6SFS2 Green	Maintain NASA success rate at or above a running average of 95 percent for missions on the FY 2006 Expendable Launch Vehicle (ELV) manifest.	5SFS15 Green	4SFS4 Green	3H03 Blue
6SFS7 White	Complete all development projects within 110% of the cost and schedule baseline.	5SFS21 Green	4SFS14 Green	None
6SFS8 Green	Deliver at least 90% of scheduled operating hours for all operations and research facilities.	5SFS22 Green	4RPFS11 Green	None
Space Shuttle				
6SSP2 White	Complete all development projects within 110% of the cost and schedule baseline.	5SSP4 Yellow	4SSP5 Green	None
6SSP3 Green	Deliver at least 90% of scheduled operating hours for all operations and research facilities.	5SSP5 Green	None	None

NASA's FY 2006 Performance Improvement Plan

The following table reports on APGs that NASA was unable to achieve fully in FY 2006 and multi-year Outcomes that NASA may not or will not achieve by the Outcome's targeted completion date. The table is organized by Strategic Goals and Sub-goals, with Efficiiency Measures at the end organized by budget Themes. For each performance shortfall, the table includes ia explanation of the specific performance problem and NASA's plan and schedule to achieve the measure in the future or an explanation of why the measure was canceled by management.

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
Strategic Goal 1: Fly the Shuttle as safely as possible until its retirement, not later than 2010.				
Outcome 1.1	Assure the safety and integrity of the Space Shuttle workforce, systems and processes, while flying the manifest.	Yellow	The Space Shuttle Program reported and investigated three major incidents in FY 2006. Two Type-B mishaps include damage to *Discovery*'s robotic manipulator arm caused while crews were servicing the Shuttle in the Orbiter Processing Facility hangar, and damage to *Atlantis*' coolant loop accumulator due to over-pressurization. NASA also reported a personnel injury at Kennedy Space Center's Launch Complex 39A.	NASA convened a mishap investigation board for each incident. The boards are on schedule to complete their investigations and deliver their final reports in FY 2007.
6SSP1	Achieve zero Type-A (damage to property at least $1M or death) or Type-B (damage to property at least $250K or permanent disability or hospitalization of 3 or more persons) mishaps in 2006.	Red	The Space Shuttle Program reported and investigated three major incidents in FY 2006. Two Type-B mishaps include damage to *Discovery*'s robotic manipulator arm caused while crews were servicing the Shuttle in the Orbiter Processing Facility hangar, and damage to *Atlantis*' coolant loop accumulator due to over-pressurization. NASA also reported a personnel injury at Kennedy Space Center's Launch Complex 39A.	NASA convened a mishap investigation board for each incident. The boards are on schedule to complete their investigations and deliver their final reports in FY 2007.
Strategic Goal 2: Complete the International Space Station in a manner consistent with NASA's International partner commitments and the needs of human exploration.				
ISS3 (Outcome 2.1)	Provide 80 percent of FY 2006 planned on-orbit resources and accommodations to support research, including power, data, crew time, logistics and accommodations.	Yellow	NASA was unable to meet the original goal of regularly scheduled Shuttle flights throughout FY 2006 due to foam issues on the external tank. While these issues were resolved, NASA did not launch the Shuttle until July 2006—10 months after the start of FY 2006. Shuttle flight delays reduced actual upmass and volume capabilities.	Shuttle schedules have been adjusted for FY 2007, but these schedules always are subject to change as circumstances warrant.

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
Sub-goal 3A: Study Earth from space to advance scientific understanding and meet societal needs.				
6ESS6 (This APG is repeated for Outcomes 3A.1, 3A.2, 3A.3, 3A.4, 3A.5, and 3A.6)	Improve level of customer satisfaction as measured by a baselined index obtained through the use of annual surveys.	Yellow	The FY 2006 EOSDIS customer satisfaction survey, performed by the Claes-Fornell Institute (CFI), produced a score of 74, a decrease from a high score of 78 in 2005, but above the federal government average of 71.	Consistent with past practice, CFI provided detailed survey data, which will enable NASA to focus its ongoing efforts to improve Earth science data, information, and services provision. Specific attention will be given to ways of maintaining and improving customer satisfaction while also focusing on the potentially conflicting, but very important, goals of increasing the number and types of users and new data types.
Outcome 3A.4 (With the addition of 6ESS22, APGs are the same as Outcome 3A.1)	Progress in quantifying the key reservoirs and fluxes in the global water cycle and in improving models of water cycle change and fresh water availability.	Yellow	Research results in 2006 enabled significant progress in understanding and modeling the water cycle. However, delays in the development and launch of the Global Precipitation Measurement (GPM) mission and the NPOESS Preparatory Project (NPP) will impact NASA's progress in this science focus area.	NASA will develop an Earth science roadmap based on the mission priorities established in the decadal survey, available in November 2006. The Agency will use the roadmap to re-baseline the support available to GPM by the end of 2006 and provide finalized support by the spring of 2007. Program funding supports the NPP 2009 launch date.
6ESS22 (Outcome 3A.4)	Complete Global Precipitation Measurement (GPM) Confirmation Review.	White	NASA management deferred the GPM mission. NASA will develop an Earth science roadmap based on the mission priorities established in the decadal survey expected from the National Research Council in December 2006. The Agency will use the roadmap to re-baseline the support available to GPM by the spring 2007.	N/A
Outcome 3A.5 (With the addition of 6ESS23, APGs are the same as Outcome 3A.1)	Progress in understanding the role of oceans, atmosphere, and ice in the climate system and in improving predictive capability for its future evolution.	Yellow	Cost overruns and technical difficulties delayed the NPOESS Preparatory Project (NPP) mission, which will impact NASA's progress in this science focus area.	Program funding supports the NPP 2009 launch date.
6ESS23 (Outcome 3A.5)	Complete Operational Readiness Review for the NPOESS Preparatory Project (NPP).	Red	Due to late delivery of the key Visible/Infrarerd Imager/Radiometer Suite (VIIRS) instrument from a program partner, NASA moved the Operational Readiness Review for NPP to September 2009.	NASA management postponed this review until FY 2008.

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
Sub-goal 3B: Understand the Sun and its effects on Earth and the solar system.				
6ESS21 (Outcome 3A.7)	Benchmark the assimilation of observations and products in decision support systems serving applications of national priority. Progress will be evaluated by the Committee on Environmental and National Resources.	Yellow	NASA completed this benchmarking in support of such areas as agricultural efficiency, air quality, aviation, disaster management, and public health. However, the external evaluation was postponed, primarily due to delays related to committee members' schedules.	The National Research Council will finalize its evaluation by spring 2007. Results will be available through *http://aiwg.gsfc.nasa.gov*, and will be addressed in the FY 2007 Performance and Accountability Report.
6ESS16 (This APG is repeated for Outcome 3B.2 and 3B.3)	Successfully launch the Solar Terrestrial Relations Observatory (STEREO).	Yellow	NASA postponed the STEREO launch due to problems with the Delta II launch vehicle 2nd stage tanks.	STEREO launched in October 2006.
Sub-goal 3C: Advance scientific knowledge of the solar system, search for evidence of life, and prepare for human exploration.				
6SSE27 (Outcome 3C.1)	Successfully launch Dawn spacecraft.	Yellow	NASA delayed the launch of Dawn due to technical difficulties.	Dawn underwent reviews to address technical and cost issues and the launch is currently scheduled for June 2007.
6SSE28 (Outcome 3C.1)	Successfully complete MErcury Surface, Space ENvironment, GEochemistry, and Ranging (MESSENGER) flyby of Venus.	White	This measure was erroneously included in the FY 2006 Performance Plan Update. MESSENGER's flyby of Venus was always scheduled for October 2006 (FY 2007).	N/A
6SSE9 (Outcome 3C.2)	Successfully demonstrate progress in understanding why the terrestrial planets are so different from one another. Progress toward achieving outcomes will be validated by external expert review.	Yellow	External reviewers deemed all of the evidence presented for this APG as positive. However, since the evidence was based on preliminary results, the external reviewers rated the progress on this goal as less robust than the progress seen in other areas of planetary science.	NASA-funded investigators are participating in the European Space Agency's Venus Express mission. Venus Express, launched in November 2005, arrived at Venus in April and is orbiting the planet, studying its atmosphere in detail. In addition, under the Discovery Program 2006 Announcement of Opportunity, NASA selected for concept study a return to Venus mission. Vesper, the Venus Chemistry and Dynamics Orbiter, proposes to significantly advance understanding of the atmospheric composition and dynamics of Venus, especially its photochemistry. Successful completion of the concept study would allow continuation into a full design effort.
6SSE19 (Outcome 3C.2)	Successfully demonstrate progress in understanding the character and extent of prebiotic chemistry on Mars. Progress toward achieving outcomes will be validated by external expert review.	Yellow	The lack of direct measurements has limited NASA's progress in this area. While laboratory and field research enabled some progress, direct measurements have not been made since the Viking missions in the 1970s.	The next two Mars missions, Phoenix, to be launched in 2007, and the Mars Science Laboratory, to be launched in 2009, have technology to directly measure organic compounds and potentially elucidate the character and extent of prebiotic chemistry.

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
Sub-goal 3C: Advance scientific knowledge of the solar system, search for evidence of life, and prepare for human exploration. (Continued)				
6SSE20 (Outcome 3C.3)	Successfully demonstrate progress in searching for chemical and biological signatures of past and present life on Mars. Progress toward achieving outcomes will be validated by external expert review.	Yellow	Although the current missions at Mars are extremely capable and have exceeded expectations, NASA did not design the instrumentation to address this objective.	The next two Mars missions, Phoenix, to be launched in 2007, and the Mars Science Laboratory, to be launched in 2009, have the capability to measure organic compounds and mineralogy to search for chemical and biological signatures of life.
Sub-goal 3D: Discover the origin, structure, evolution, and destiny of the universe, and search for Earth-like planets.				
6UNIV19 (Outcome 3D.1)	Complete Gamma-ray Large Area Space Telescope (GLAST) Spacecraft Integration and Test (I&T).	Yellow	NASA postponed the GLAST I&T due to electronic parts problems and the need to change release mechanisms on the spacecraft.	Spacecraft I&T is scheduled currently for early FY 2007.
6UNIV20 (This APG is repeated for Outcome 3D.1, 3D.2, and 3D.3)	Complete James Webb Space Telescope (JWST) Mission Preliminary Design Review (PDR).	Red	NASA revised the JWST schedule in response to growth in the cost estimate that NASA had identified in FY 2005.	NASA moved the launch date to 2013. As a result, NASA will hold the PDR in March 2008.
Outcome 3D.2	Progress in understanding how the first stars and galaxies formed, and how they changed over time into the objects recognized in the present universe.	Yellow	NASA made scientific progress toward this Outcome, but delays in the development and launch of JWST will impact future results.	The James Webb Space Telescope has undergone a comprehensive project replan. The mission is scheduled to launch in 2013.
6UNIV16 (Outcome 3D.2)	Successfully demonstrate progress in discovering how the interplay of baryons, dark matter, and gravity shapes galaxies and systems of galaxies. Progress toward achieving outcomes will be validated by external expert review.	Yellow	The external review found that NASA made limited progress toward this performance goal. Comments included the opinion that this goal, as written, was too challenging or ambitious, and suggested that it be dropped. Reviewers noted that APGs 6UNIV14 and 6UNIV17 also will yield information about the interplay of baryons, dark matter, and gravity in the evolution of galaxies.	NASA will change this APG in FY 2007.
Outcome 3D.3	Progress in understanding how individual stars form and how those processes ultimately affect the formation of planetary systems.	Yellow	NASA made scientific progress on this Outcome, but future results will be impacted by delays in the SOFIA and JWST programs. These two new facilities are expected to make significant progress in star formation studies because of their mid- and far-infrared observation capabilities.	See SOFIA (6UNIV18) and JWST (6UNIV20) performance measures.

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
Sub-goal 3D: Discover the origin, structure, evolution, and destiny of the universe, and search for Earth-like planets. (Continued)				
6UNIV18 (Outcome 3D.3)	Complete Stratospheric Observatory for Infrared Astronomy (SOFIA) Airworthiness Flight Testing.	Red	NASA chartered a review in March 2006 to document the status of the SOFIA Program and to identify and analyze options. NASA determined the most appropriate course of action is to continue the SOFIA Program with significant program restructuring, including transferring the direct management of SOFIA's airborne system (aircraft and telescope) development and extensive flight testing to Dryden Flight Research Center.	NASA will transfer the SOFIA airborne system to DFRC in early 2007 to initiate the flight test program. An operational readiness review will follow completion of this extensive flight test program in 2010.
Outcome 3D.4	Progress in creating a census of extra-solar planets and measuring their properties.	Yellow	NASA made scientific progress on the Outcome, but delays in the development and deployment of next generation missions will impact further results.	Kepler I&T is scheduled to begin in June 2007, with a launch readiness date of November 2008. NASA deferred the Space Interferometry Mission (SIM) beyond the budget planning period.
6UNIV5 (Outcome 3D.4)	Successfully demonstrate progress in determining how common Earth-like planets are and whether any might be habitable. Progress toward achieving outcomes will be validated by external expert review.	Yellow	Continued delays of SIM and Kepler constitute slow progress toward achieving this goal.	Kepler I&T is scheduled to begin in June 2007, with a launch readiness date of November 2008. NASA deferred the SIM beyond the budget planning period.
6UNIV21 (Outcome 3D.4)	Begin Kepler Spacecraft Integration and Test (I&T).	Yellow	Inefficiencies, particularly with regard to work on the spacecraft's photometer, caused delays and cost impacts for the Kepler project and an inability to maintain the previous launch schedule of June 2008.	Kepler I&T is currently scheduled to begin in June 2007, with a launch readiness date of November 2008.
Sub-goal 3E: Advance knowledge in the fundamental disciplines of aeronautics, and develop technologies for safer aircraft and higher capacity airspace systems.				
6AT14 (Outcome 3E.1)	Complete Aviation Safety Program restructuring activities in order to focus research efforts more precisely on the Nation's aviation safety challenges for the Next Generation Air Transportation System (2025) and beyond.	Yellow	The Aviation Safety Program delayed approval of one of its four projects: The Integrated Resilient Aircraft Controls, which develops capabilities to reduce (or eliminate) aircraft loss-of-control accidents and ensure safe flight under off-nominal conditions.	Program management expects final approval of this project during the first quarter of FY 2007.

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
Sub-goal 3E: Advance knowledge in the fundamental disciplines of aeronautics, and develop technologies for safer aircraft and higher capacity airspace systems. (Continued)				
(Outcome 3E.1)	Utilizing a competitive peer-reviewed selection process, determine the research portfolio and partnerships to enable advances in the Aviation Safety thrust areas (Integrated Intelligent Flight Deck Technologies, Integrated Vehicle Health Management, Integrated Resilient Aircraft Controls, and Aircraft Aging and Durability.)	Yellow	The Aviation Safety Program delayed approval of one of its four projects: The Integrated Resilient Aircraft Controls, which develops capabilities to reduce (or eliminate) aircraft loss-of-control accidents and ensure safe flight under off-nominal conditions.	Program management expects final approval of this project during the first quarter of FY 2007.
6AT16 (Outcome 3E.2)	Complete Airspace Systems Program restructuring activities in order to align research efforts to address the Joint Planning and Development Office's Next Generation Air Transportation System (NGATS) capability requirements for 2025. (New APG)	Yellow	The Airspace Systems Program delayed approval of a portion of its project portfolio (the NGATS Air Traffic Management Airportal project) that will develop capabilities to increase throughput in terminal and airport domains enabling NGATS.	The approval of the NGATS Air Traffic Management Airportal Project is expected in the first quarter of FY 2007.
6AT17 (Outcome 3E.2)	Utilizing a competitive peer-reviewed selection process, determine the research portfolio and partnerships to enable advances in the Airspace Systems thrust areas (Next Generation Air Transportation Systems and Super Density Surface Management.) (New APG)	Yellow	The Airspace Systems Program delayed approval of a portion of its project portfolio (the NGATS Air Traffic Management Airportal project) that will develop capabilities to increase throughput in terminal and airport domains enabling NGATS.	The approval of the NGATS Air Traffic Management Airportal Project is expected in the first quarter of FY 2007.
6AT8 (Outcome 3E.3)	Identify and document engine configuration and noise reduction technologies needed to enable 10 dB reduction in aircraft system noise. (APG revised based on FY06 Appropriation.)	White	This APG was part of NASA's FY 2005 Vehicle Systems close-out activities. Due to Aeronautics Research Mission Directorate restructuring, this APG no longer aligns with NASA's research goals and has been canceled.	N/A
6AT11 (Outcome 3E.3)	Complete trade study of unconventional propulsion concepts for a zero-emissions vehicle.	White	This APG was part of NASA's FY 2005 Vehicle Systems close-out activities. Due to Aeronautics Research Mission Directorate restructuring, this APG no longer aligns with NASA's research goals and has been canceled.	N/A
Sub-goal 3F: By 2008, develop and test candidate countermeasures to ensure the health of humans traveling in space.				
6HSRT9 (Outcome 3F.1)	Complete renal stone countermeasure development.	Yellow	NASA researchers did not complete the renal stone countermeasure study.	Data collection from the final subject is scheduled for March 2007.

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
Sub-goal 3F: By 2008, develop and test candidate countermeasures to ensure the health of humans traveling in space. (Continued)				
6HSRT14 (Outcome 3F.2)	Define requirements for the Condensing Heat Exchanger Flight experiment focused on improving space condenser reliability.	White	NASA canceled the Condensing Heat Exchanger Flight experiment.	N/A
Strategic Goal 4: Bring a new Crew Exploration Vehicle into service as soon as possible after Shuttle retirement.				
6HSRT1 (Outcome 4.2)	Complete the technology trade studies for both the in-space and surface EVA suits.	White	Due to changes in the Extravehicular Activity Systems architecture, NASA canceled the APGs under Outcome 4.2. NASA will include appropriately revised APGs in the FY 2007 Performance Plan Update submitted with the Agency's FY 2008 Budget Estimates. Meanwhile, the Constellation Systems Program continues work on a single, integrated spacesuit design to support Outcome 4.2.	N/A
6HSRT2 (Outcome 4.2)	Complete the system requirements review for both the in-space and surface exploration EVA suits.	White	Due to changes in the Extravehicular Activity Systems architecture, NASA canceled the APGs under Outcome 4.2. NASA will include appropriately revised APGs in the FY 2007 Performance Plan Update submitted with the Agency's FY 2008 Budget Estimates. Meanwhile, the Constellation Systems Program continues work on a single, integrated spacesuit design to support Outcome 4.2.	N/A
Strategic Goal 6: Establish a lunar return program having the maximum possible utility for later missions to Mars and other destinations.				
6ESRT2 (Outcome 6.2)	Identify and test technologies to enable in-space assembly, maintenance, and servicing. Technology development includes modular truss structures, docking mechanisms, micro-spacecraft inspector, intelligent robotic manipulators, and advanced software approaches for telerobotic operations.	White	Throughout FY 2006, NASA made program-investment decisions based on the exploration architecture, which determined the technology priorities for NASA's lunar exploration program. Based on these findings, NASA cancelled all work related to in-space assembly (6ESRT2) and the In-space Technology Experiments (InSTEP) project (6ESRT7). NASA also decided that the Quality Function Deployment Process was no longer needed.	N/A

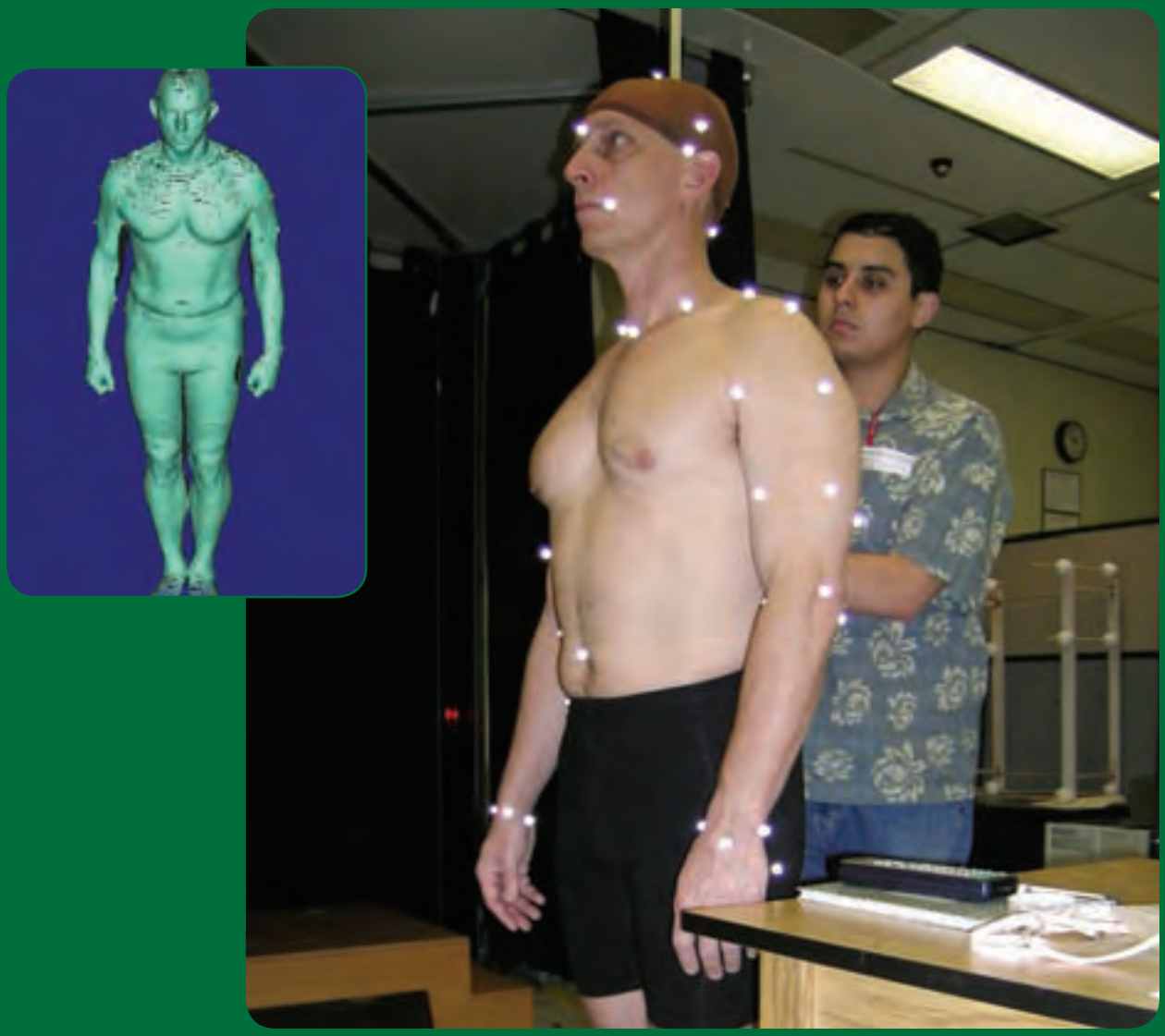
Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
Strategic Goal 6: Establish a lunar return program having the maximum possible utility for later missions to Mars and other destinations. (Continued)				
6ESRT5 (Outcome 6.2)	Validate the ESMD research and technology development needs and opportunities by implementing a Quality Function Deployment process, and use the results to guide ESR&T program investment decisions.	White	Throughout FY 2006, NASA made program-investment decisions based on the exploration architecture, which determined the technology priorities for NASA's lunar exploration program. Based on these findings, NASA canceled all work related to in-space assembly (6ESRT2) and the In-space Technology Experiments (InSTEP) project (6ESRT7). NASA also decided that the Quality Function Deployment Process was no longer needed.	N/A
6ESRT7 (Outcome 6.2)	Identify and define technology flight experiment opportunities to validate the performance of critical technologies for exploration missions.	White	Throughout FY 2006, NASA made program-investment decisions based on the exploration architecture, which determined the technology priorities for NASA's lunar exploration program. Based on these findings, NASA canceled all work related to in-space assembly (6ESRT2) and the In-space Technology Experiments (InSTEP) project (6ESRT7). NASA also decided that the Quality Function Deployment Process was no longer needed.	N/A
6PROM1 (Outcome 6.3)	Following completion of the Prometheus Analysis of Alternatives, complete space nuclear reactor conceptual design.	White	NASA canceled these APGs due to a program focus shift from nuclear electric propulsion development to surface nuclear power systems development. NASA will include appropriately revised APGs for Outcome 6.3 in the FY 2007 Performance Plan Update submitted with the Agency's FY 2008 Budget Estimates. Meanwhile, the Prometheus Program will continue work toward achieving Outcome 6.3 on schedule.	N/A
6PROM2 (Outcome 6.3)	Verify and validate the minimum functionality of initial nuclear electric propulsion (NEP) spacecraft capability.	White	NASA canceled these APGs due to a program focus shift from nuclear electric propulsion development to surface nuclear power systems development. NASA will include appropriately revised APGs for Outcome 6.3 in the FY 2007 Performance Plan Update submitted with the Agency's FY 2008 Budget Estimates. Meanwhile, the Prometheus Program will continue work toward achieving Outcome 6.3 on schedule.	N/A

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
Strategic Goal 6: Establish a lunar return program having the maximum possible utility for later missions to Mars and other destinations. (Continued)				
6PROM3 (Outcome 6.3)	Complete component level tests and assessments of advanced power conversion systems.	White	NASA canceled these APGs due to a program focus shift from nuclear electric propulsion development to surface nuclear power systems development. NASA will include appropriately revised APGs for Outcome 6.3 in the FY 2007 Performance Plan Update submitted with the Agency's FY 2008 Budget Estimates. Meanwhile, the Prometheus Program will continue work toward achieving Outcome 6.3 on schedule.	N/A
Cross-Agency Support Programs: Education				
6ED4 (Outcome ED-1)	Complete a retrospective longitudinal study of student participants to determine the degree to which participants entered the NASA workforce or other NASA-related career fields.	Yellow	NASA did not complete the retrospective study of student participants' entry into the NASA workforce due to technical issues directly related to the large population of potential survey respondents.	NASA is adjusting the survey instrument and protocol and the survey will be completed in FY 2007.
6ED7 (Outcome ED-1)	Provide approximately 50 grants to enhance the capability of approximately 25 underrepresented and underserved colleges and universities to compete for and conduct basic or applied NASA-related research. (APG revised: grants reduced from 350 to 50 based on FY 2006 Appropriation.)	Yellow	NASA exceeded the number of institutions during FY 2006, but did not achieve the targeted number of grant awards.	NASA's FY 2007 budget includes funds necessary to achieve future goals.
Efficiency Measures: Education				
6ED12	Peer review and competitively award at least 80%, by budget, of research projects.	Red	NASA could not complete this performance measure due to Congressionally directed, site-specific projects which accounted for approximately 50% of the Education Program's appropriation.	NASA has briefed relevant Congressional committee staff regarding the impact of Congressional interest items. NASA's FY 2007 program plan will achieve the target of 80% competitive awards unless Congressionally directed appropriations exceed 20% of the budget.

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
Efficiency Measures: Earth–Sun System				
6ESS24	Complete all development projects within 110% of the cost and schedule baseline.	Red	The STEREO and AIM missions, scheduled for completion in FY 2006, exceeded 110% of the cost and schedule baselines. After launch vehicle delays, STEREO was launched on October 25, 2006, exceeding the baseline schedule by 25%. The final cost exceeded the baseline by 26%. AIM is currently scheduled for launch in spring 2007 and is expected to exceed both the cost and schedule baselines by approximately 20% due to delays associated with the launch vehicle and the failure of the SOFIE instrument during observatory vibration testing.	NASA will continue to conduct appropriate reviews as the AIM mission progresses toward launch.
Efficiency Measures: Solar System Exploration				
6SSE29	Complete all development projects within 110% of the cost and schedule baseline.	Red	The New Horizon and Dawn missions, scheduled for completion in FY 2006, exceeded 110% of the cost baseline. New Horizons, which was launched on time—January 19, 2006—exceeded the cost baseline by 15%. The Dawn mission, which underwent reviews to address technical and cost issues, is expected to exceed the cost baseline by 32% and the schedule baseline by 43% with the launch being delayed to 2007.	NASA will continue to conduct appropriate reviews as the Dawn mission progresses toward launch.
Efficiency Measures: The Universe				
6UNIV22	Complete all development projects within 110% of the cost and schedule baseline.	White	NASA did not schedule development projects related to this APG for completion in FY 2006.	N/A
6UNIV25	Reduce time within which 80% of NRA research grants are awarded, from proposal due date to selection, by 5% per year, with a goal of 130 days.	Yellow	NASA reduced the time necessary to award 80% of NRA grants by 2.5% from FY 2005 to FY 2006, missing the 5% target.	The Science Mission Directorate will continue to make efforts to reduce processing times and expects to meet this APG assuming no changes in procurement requirements or funding calendar.
Efficiency Measures: Exploration Systems Research and Technology				
6ESRT13	Complete all development projects within 110% of the cost and schedule baseline.	White	The technology priorities identified by the exploration architecture prompted restructuring of the technology program.	N/A

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
Efficiency Measures: Exploration Systems Research and Technology (Continued)				
6ESRT14	Peer review and competitively award at least 80%, by budget, of research projects.	White	The Exploration Technology Development Program (ETDP) did not issue any competitive solicitations this year for new research projects as a result of significant restructuring as mandated by ESAS. In the future, ETDP may use competitive solicitations where appropriate to address the priorities for lunar exploration.	N/A
6ESRT15	Reduce annually, the time to award competed projects, from proposal receipt to selection.	White	The ETDP did not issue any competitive solicitations this year for new research projects as a result of significant restructuring as mandated by ESAS. In the future, ETDP may use competitive solicitations where appropriate to address the priorities for lunar exploration.	N/A
6PROM4	Complete all development projects within 110% of the cost and schedule baseline.	White	This APG pertains to the conceptual design of a Nuclear Electric Propulsion (NEP) reactor. NASA has canceled the NEP project and all associated activities.	N/A
6PROM5	Reduce annually, the time to award competed projects, from proposal receipt to selection.	White	This APG pertains to the conceptual design of an NEP reactor. NASA has canceled the NEP project and all associated activities.	N/A
Efficiency Measures: Human Systems Research and Technology				
6HSRT22	Increase annually, the percentage of grants awarded on a competitive basis.	White	In October 2005 NASA instituted the Human Research Program (HRP) as a successor to the Human System Research and Technology (HSRT) program. HRP has focused on directed research tasks, as approved in the Program Management Plan (document number HRP-47051) to effectively use available funding and other resources. Therefore, this APG is no longer considered applicable by management directive.	N/A
Efficiency Measures: Space Flight Support				
6SFS7	Complete all development projects within 110% of the cost and schedule baseline.	White	There are no developmental programs in this organization.	N/A
Efficiency Measures: Space Shuttle				
6SSP2	Complete all development projects within 110% of the cost and schedule baseline.	White	NASA will retire the Space Shuttle once its role in International Space Station assembly is complete, by 2010. NASA does not plan to implement any additional major modifications to the Space Shuttle system before retirement.	N/A

Part 3: Financials



Previous page: A trainer helps lower astronauts Joseph Tanner and Heidemarie Stefanyshyn-Piper (partially obscured), both STS-115 mission specialists, into the water of NASA's Neutral Buoyancy Laboratory, located near the Johnson Space Center. Tanner and Stefanyshyn-Piper are attired in training versions of the Extravehicular Mobility Unit spacesuit. SCUBA-equipped divers are in the water to assist the crewmembers in their rehearsal, intended to help prepare them for work on the exterior of the International Space Station. (NASA)

Above: Astronaut Clayton Anderson, wearing shorts and a skull cap, remains still during a three-hour process in which NASA technicians use new laser technology to gather data about his physical measurements (large photo). The technicians run use the data to create a three-dimensional Audio Video Interleaved file of the astronaut's body (upper left) that they can use to match the astronaut with a spacesuit of the correct size and shape. By expanding and analyzing the database, scientists and engineers can determine what kinds of general body shapes, heights, arm lengths, hand sizes, and and other measurements are most common among those selected to fly in space. (NASA)

Message from the Chief Financial Officer

NASA's financial community enters fiscal year (FY) 2007 with an unwavering commitment to achieving financial management excellence. Recognizing the progress we have made over the past year, we acknowledge continued room for improvement and fully accept responsibility for improving the health and operation of the Agency's financial management processes.

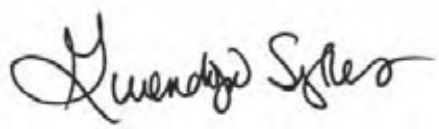
In FY 2006, the Agency implemented a broad program of corrective actions to address its financial management weaknesses. Progress on those corrective actions is the result of significant cross-Agency effort. Much of the work that remains is in the stabilization of improved processes so that they consistently and regularly deliver expected results. In their report, the Agency's independent auditors acknowledged the progress made in NASA's financial management processes, particularly in the areas of differences in Fund Balance with Treasury and the estimation of Unfunded Environmental Liabilities. I am pleased to report that both of these weaknesses were resolved in FY 2006. NASA will continue to monitor reconciliation processes and other associated controls to ensure that these accounts remain firmly in control.

While the Agency has made progress, significant challenges remain. The Agency's independent auditors, have noted two modified repeat conditions, both material weaknesses, for FY 2006: Financial Systems, Analyses and Oversight; and Property, Plant and Equipment. System and process limitations continue to require compensating controls, and have limited NASA's ability to accumulate, analyze, and distribute reliable financial information. The Agency recognizes these deficiencies and continues to work diligently toward their resolution. We invite you to read the expanded financial management section that follows to learn more about these weaknesses and the improvement actions we completed in FY 2006.

In addition to the corrective actions taken, FY 2006 was also a year of preparation for a major update to NASA's Core Financial system. Enhancements to the system, to be implemented with the beginning of FY 2007, will further integrate our process changes and improve our systems. Also, we will continue to use the practice initiated last year to develop a FY 2006 Financial Audit Corrective Action Plan. We are working diligently to meet the requirements for an opinion to be rendered on our FY 2007 financial statements.

NASA's mission success includes healthy financial management and effective reporting on the resources entrusted to the Agency. We remain dedicated to achieving that mission.

Sincerely,



Gwendolyn Sykes
Chief Financial Officer

Financial Management Improvement

In FY 2006, NASA implemented a Financial Audit Corrective Action Plan (CAP) to address weaknesses identified in the 2005 financial audit. The steps the Agency took in support of the CAP leveraged the stabilization gains made in 2005. As of the 3rd Quarter of FY 2006, the Office of Management and Budget (OMB) acknowledged NASA's progress toward improved financial management by upgrading its measure for NASA's Financial Management PMA progress to "Yellow."

The Agency recognizes that there is much work to be done as it continues to improve NASA's financial management performance. NASA is aggressively working toward eliminating all financial weaknesses as a part of the Agency's effort toward achieving auditable financial records and actionable financial information for decision making. A summary of progress and accomplishments, by FY 2005 audit weakness, follows.

2006 Financial Management Improvement Efforts

1. Financial Systems, Analyses, and Oversight

To improve NASA's ability to accumulate, analyze and distribute reliable financial information, the Agency has developed and is implementing procedures to validate financial data and processes in the Agency's Core Financial system, strengthened internal controls to ensure consistency with authoritative guidance, and aligned its external financial reporting with federal requirements.

Following NASA's Financial Management Requirements, Volume 19—Periodic Monitoring Controls Activities, each NASA Center conducts regular reconciliations of key financial accounts or activities. The results of these reconciliations, including associated corrective action plans, are certified by Center CFOs and reported to NASA Headquarters on a monthly basis. As a result, NASA is given a view of any emerging systemic data integrity issues, which facilitates coordinated improvements designed to eliminate the root causes of issues.

Statement of Material Weakness:
Financial Systems, Analyses, and Oversight

Summary Auditor Finding:
"Although progress was made [since the 2004 audit], significant financial management issues continue to impair NASA's ability to accumulate, analyze, and distribute reliable financial information."
(Reference: NASA FY 2005 Performance and Accountability Report (PAR), Part 3, page 193)

In addition, the Agency prepares monthly and quarterly Agency financial statements within 30 days of period close. This process includes the documentation of any data anomalies or corrections, and statement analyses. Monthly financial statements are used to ensure appropriate processing of financial information. Also, compared to FY 2005, NASA modified the presentation of its Statement of Net Costs to provide a breakdown of net costs by major lines of business, consistent with Office of Management and Budget Circular A-136. The ability to associate costs to major lines of business is a result of a major account structure change that NASA introduced at the beginning of the fiscal year.

Finally, the Agency developed and published monthly financial metrics, providing both process and outcome measures of NASA's financial performance. These metrics are reviewed at monthly financial management senior leader-ship meetings to discuss performance and trends, and to share best practices.

Throughout 2007, the Agency will continue to review and certify Center-level financial accounts and activities on a monthly basis. Financial statements and metrics, also on a monthly basis, will be prepared and reviewed by management.

2. Property, Plant and Equipment

To address material weaknesses in Property, Plant and Equipment accounting, NASA has taken steps in FY 2006 to rectify policy and process weaknesses.

NASA is considering a change in its accounting policy for Theme Assets to reclassify some costs previously categorized as General Property, Plant & Equipment (PP&E) as Research and Development (R&D) expenses. In

FY 2006, NASA drafted a policy to implement this change and requested that FASAB clarify the accounting standards the Agency used as the basis for the draft change. NASA anticipates a response from FASAB in FY 2007.

Also in 2006, NASA implemented compensating controls to address PP&E process weaknesses, including establishment of procurement guidance to facilitate improved accounting for property furnished to contractors. NASA is developing improved business processes for all asset categories to improve the effective lifecycle management of PP&E.

In 2007, the Agency expects to finalize its accounting treatment policy for NASA's Theme Assets. Also, NASA will align policies, processes and systems for all of its asset categories with the appropriate accounting treatments. This includes alignment of contract requirements, related primarily to contractor property reporting, with agreed upon policies.

3. Fund Balance with Treasury

To address NASA's 2005 material weakness in Fund Balance with Treasury (FBWT), the Agency has resolved outstanding reconciling items from prior periods and introduced reconciliation procedures that are tracking current period differences so they may be resolved in a timely manner. NASA Centers are required to provide monthly reconciliation reports for Agency measurement and oversight.

NASA will continue to monitor FBWT differences on a monthly basis. Corrective actions will be taken on each difference, and progress on those actions will be monitored to ensure that differences are resolved in a timely manner.

4. Estimation of Environmental Liabilities

To address weaknesses in the estimation of NASA's unfunded environmental liabilities (UEL), the Agency implemented policies, processes, tools and training that generated auditable estimates of UEL for all Centers by the second Quarter of FY 2006.

To develop these estimates, NASA enhanced the policies and procedures for the estimation of unfunded environmental liabilities for both environmental engineers and accountants. These policies and procedures are documented and consistent for all Centers, resulting in more uniform, reliable and valid estimates.

The Agency also held joint training classes for environmental engineers and accountants responsible for determining and documenting unfunded environmental liability (UEL) to ensure consistent understanding and practice.

Statement of Material Weakness:
Enhancements needed for controls over Property, Plant and Equipment (PP&E) and materials

Summary Auditor Finding:
"Consistent with prior year audit reports, our review of property, plant, and equipment (PP&E), totaling approximately $35.0 billion, identified serious weaknesses in internal control that, if not corrected, could prevent material misstatements from being detected and corrected in a timely manner."
(Reference: NASA FY 2005 Performance and Accountability Report (PAR), Part 3, page 203)

Statement of Material Weakness:
Further Research Required to Resolve Fund Balance With Treasury Differences

Summary Auditor Finding:
"Although we were informed that many errors from FY 2003 were resolved, significant errors within the accounting system were still being identified by NASA in FY 2005. Fund balance with Treasury reconciliation processes were ineffective in FY 2004 and much of FY 2005, through the date of our visits to centers, but it is our understanding that steps taken by NASA in the last quarter of the year are believed by NASA management to have substantially improved the effectiveness of such reconciliations."
(Reference: NASA FY 2005 Performance and Accountability Report (PAR), Part 3, page 201)

Statement of Reportable Condition:
Internal controls in estimating NASA's Environmental Liabilities require enhancement

Summary Auditor Finding
"During our review of NASA's environmental liability estimates totaling $825 million as of September 30, 2005, and related disclosures to the financial statements, we continued to note weaknesses in NASA's ability to generate an auditable estimate of its unfunded environmental liabilities (UEL) and to identify potential financial statement disclosure items because of a lack of sufficient, auditable evidence."
(Reference: NASA FY 2005 Performance and Accountability Report (PAR), Part 3, page 207)

Introduction to the Principal Financial Statements

The Principal Financial Statements have been prepared to report the financial position and results of operations of the National Aeronautics and Space Administration (NASA). The Statements have been prepared from the books and records of NASA in accordance with formats prescribed by the Office of Management and Budget (OMB) in Circular A-136, Financial Reporting Requirements. The statements are in addition to financial reports prepared by the Agency in accordance with OMB and U.S. Department of the Treasury (Treasury) directives to monitor and control the status and use of budgetary resources, which are prepared from the same books and records. The statements should be read with the understanding that they are for a components of the U.S. Government, a sovereign entity. The Agency has no authority to pay liabilities not covered by budgetary resources. Liquidation of such liabilities requires enactment of an appropriation. Comparative data for 2005 are included where available.

NASA's Principal Financial Statements include the following:

The **Consolidated Balance Sheet** provides information on assets, liabilities, and net position similar to balance sheets reported in the private sector. Assets must equal the sum of liabilities and net position.

The **Consolidated Statement of Net Cost** reports the components of the net costs of the Agency's operations for the period. The net cost of operations consists of the gross cost incurred by the Agency less any exchange (i.e., earned) revenue from activities.

The **Consolidated Statement of Changes in Net Position** reports the beginning net position, the transactions that affect net position for the period, and the ending net position.

The **Combined Statement of Budgetary Resources** provides information on how budgetary resources were made available and their status at the end of the year. Information in this statement is reported on the budgetary basis of accounting.

The **Consolidated Statement of Financing** reports the relationship between budgetary transactions and financial transactions.

Required Supplementary Stewardship Information provides information on the Agency's Research and Development costs.

Required Supplementary Information contains a Combined Statement of Budgetary Resources and information on Deferred Maintenance.

National Aeronautics and Space Administration
Consolidated Balance Sheet
As of September 30, 2006, and September 30, 2005
(In Millions)

	Unaudited 2006	Unaudited 2005
Assets (Note 2):		
Intragovernmental Assets		
Fund Balance with Treasury (Note 3)	$ 9,585	$ 8,146
Investments (Note 4)	17	17
Accounts Receivable, Net (Note 5)	180	136
Total Intragovernmental Assets	9,782	8,299
Accounts Receivable, Net (Note 5)	5	60
Inventory and Related Property, Net (Note 6)	2,330	3,019
General Property, Plant and Equipment, Net (Note 7)	33,193	34,926
Total Assets	**$ 45,310**	**$ 46,304**
Stewardship PP&E (Note 17)		
Liabilities (Note 8):		
Intragovernmental Liabilities		
Accounts Payable	$ 145	$ 56
Other Liabilities (Note 9)	157	124
Total Intragovernmental Liabilities	302	180
Accounts Payable	1,703	2,076
Federal Employee and Veteran Benefits	60	62
Environmental and Disposal Liabilities (Note 10)	893	825
Other Liabilities (Notes 9 and 11)	355	340
Total Liabilities	**3,313**	**3,483**
Net Position:		
Unexpended Appropriations	6,981	5,318
Cumulative Results of Operations	35,016	37,503
Total Net Position	**41,997**	**42,821**
Total Liabilities and Net Position	**$ 45,310**	**$ 46,304**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Consolidated Statement of Net Cost
For the Fiscal Year Ended September 30, 2006
(In Millions)

Cost by Business Line

	Unaudited 2006
Science	
Gross Costs	$ 6,628
Less: Earned Revenue	348
Net Costs	6,280
Exploration Systems	
Gross Costs	2,704
Less: Earned Revenue	88
Net Costs	2,616
Aeronautics Research	
Gross Costs	1,129
Less: Earned Revenue	79
Net Costs	1,050
Space Operations	
Gross Costs	8,120
Less: Earned Revenue	424
Net Costs	7,696
Net Cost of Operations	**$ 17,642**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Consolidated Statement of Net Cost
For the Fiscal Year Ended September 30, 2005
(In Millions)

	Unaudited 2005	
Program Cost:		
Gross Costs	$	16,085
Less: Earned Revenues		879
Net Cost of Operations	**$**	**15,206**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Consolidated Statement of Changes in Net Position
For the Fiscal Years Ended September 30, 2006, and September 30, 2005
(In Millions)

	Unaudited 2006	Unaudited 2005
Cumulative Results of Operations:		
Beginning Balances	$ 37,503	$ 36,934
Budgetary Financing Sources:		
Appropriations Used	14,958	15,588
Nonexchange Revenue	48	35
Other Financing Sources:		
Transfers In Without Reimbursement	—	1
Imputed Financing	149	151
Total Financing Sources	15,155	15,775
Net Cost of Operations	(17,642)	(15,206)
Net Change	(2,487)	569
Cumulative Results of Operations	**$ 35,016**	**$ 37,503**
Unexpended Appropriations:		
Beginning Balances	$ 5,318	$ 4,771
Budgetary Financing Sources:		
Appropriations Received	16,842	16,324
Appropriations Used	(14,958)	(15,588)
Appropriations Transferred In/Out	26	—
Other Adjustments	(247)	(189)
Total Budgetary Financing Sources	$ 1,663	$ 547
Total Unexpended Appropriations	$ 6,981	$ 5,318
Net Position	**$ 41,997**	**$ 42,821**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Combined Statement of Budgetary Resources
For the Fiscal Years Ended September 30, 2006, and September 30, 2005
(In Millions)

	Unaudited 2006	Unaudited 2005
Budgetary Resources:		
Unobligated Balance, Brought Forward, October 1:	$ 2,241	$ 3,101
Recoveries of Prior Year Unpaid Obligations	368	10
Budgetary Authority		
Appropriation	16,843	16,315
Spending Authority from Offsetting Collections		
Earned		
Collected	989	851
Change in Receivables from Federal Sources	41	21
Change in Unfilled Customer Orders		
Advance Received	57	10
Without Advance from Federal Sources	(208)	117
Subtotal	17,722	17,314
Nonexpenditure Transfers, Net		
Actual Transfers, Budget Authority	26	—
Permanently Not Available		
Cancellations of Expired and No-year Accounts	(37)	(60)
Enacted Reductions	(210)	(129)
Total Budgetary Resources	**$ 20,110**	**$ 20,236**
Status of Budgetary Resources:		
Obligations Incurred (Note 14)		
Direct	$ 16,768	$ 16,979
Reimbursable	1,005	1,019
Total Obligations Incurred	17,773	17,998
Unobligated Balance		
Apportioned	2,143	2,073
Exempt from Apportionment	4	4
Total Unobligated Balances, Available	2,147	2,077
Unobligated Balance Not Available	190	161
Total Status of Budgetary Resources	**$ 20,110**	**$ 20,236**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Combined Statement of Budgetary Resources (Continued)
For the Fiscal Years Ended September 30, 2006, and September 30, 2005
(In Millions)

	Unaudited 2006	Unaudited 2005
Change in Obligated Balance:		
Obligated Balances, Net		
Unpaid Obligations Brought Forward, October 1 (Note 13)	$ 6,525	$ 4,972
Less: Uncollected Customer Payments from Federal Sources, Brought Forward, October 1	552	413
Total Unpaid Obligated Balances, Net	**5,973**	**4,559**
Obligations Incurred, Net	17,773	17,998
Less: Gross Outlays	16,259	16,472
Less: Recoveries of Prior Year Unpaid Obligations	368	10
Change in Uncollected Customer Payments from Federal Sources	167	(138)
Obligated Balance, Net, End of Period		
Unpaid Obligations	7,671	6,488
Less: Uncollected Customer Payments from Federal Sources	385	551
Total, Unpaid Obligated Balance, Net, End of Period	**7,286**	**5,937**
Net Outlays:		
Net Outlays:		
Gross Outlays	16,259	16,472
Less: Offsetting Collections	1,045	861
Less: Distributed Offsetting Receipts	8	—
Net Outlays	**$ 15,206**	**$ 15,611**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Consolidated Statement of Financing
For the Fiscal Years Ended September 30, 2006, and September 30, 2005
(In Millions)

	Unaudited 2006	Unaudited 2005
Resources Used to Finance Activities:		
Budgetary Resource Obligated		
Obligations Incurred	$ 17,773	$ 17,998
Less: Spending Authority from Offsetting Collections and Recoveries	1,247	1,009
Obligations Net of Offsetting Collections and Recoveries	16,526	16,989
Less: Offsetting Receipts	8	—
Net Obligations	**16,518**	**16,989**
Other Resources:		
Transfers In Without Reimbursements	—	1
Imputed Financing from Costs Absorbed by Others	149	151
Net Other Resources Used to Finance Activities	**149**	**152**
Total Resources Used to Finance Activities	**16,667**	**17,141**
Resources Used to Finance Items Not Part of the Net Cost of Operations		
Change in Budgetary Resources Obligated for Goods, Services, and Benefits Ordered but Not Yet Provided	(1,598)	(1,389)
Resources That Fund Expenses Recognized in Prior Periods	(47)	(194)
Budgetary Offsetting Collections and Receipts that Do Not Affect the Net Costs of Operations—Other	55	(35)
Resources that Finance the Acquisition of Assets	(3,474)	(4,794)
Other Resources or Adjustments to Net Obligated Resources that Do Not Affect Net Cost of Operation	—	(1)
Total Resources Used to Finance Items Not Part of the Net Cost of Operations	**(5,064)**	**(6,413)**
Total Resources Used to Finance the Net Cost of Operations	**11,603**	**10,728**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Consolidated Statement of Financing (Continued)
For the Fiscal Years Ended September 30, 2006, and September 30, 2005
(In Millions)

	Unaudited 2006	Unaudited 2005
Components of Net Cost That Will Not Require or Generate Resources in the Current Period		
Components Requiring or Generating Resources in Future Periods: (Note 16)		
Increases\Decreases in Annual Leave Liability	8	(4)
Increase in Environmental and Disposal Liability	68	—
Increase in Exchange Revenue Receivable from the Public	—	28
Other	180	44
Total Components of Net Cost that Will Require or Generate Resources in Future Periods	**256**	**68**
Components Not Requiring or Generating Resources		
Depreciation	5,730	4,417
Revaluation of Assets or Liabilities	7	—
Other	46	(7)
Total Components of Net Cost of Operations that Will Not Require or Generate Resources	**5,783**	**4,410**
Total Components of Net Cost of Operations that Will Not Require or Generate Resources in the Current Period	**6,039**	**4,478**
Net Cost of Operations	**$ 17,642**	**$ 15,206**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Notes to Financial Statements
(Fiscal Years 2006 and 2005 Are Unaudited)

NOTE 1. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Reporting Entity

The National Aeronautics and Space Administration (NASA) is an independent Agency that was established by Congress on October 1, 1958 by the National Aeronautics and Space Act of 1958. NASA was incorporated from the Agency's predecessor organization, the National Advisory Committee for Aeronautics, which provided technical advice to the United States aviation industry and performed aeronautics research. Today, NASA serves as the fulcrum for initiatives by the U.S. in civil space and aviation.

As of August 2004, NASA is organized into four Business Lines which focus on the following objectives:

- **Exploration Systems:** creating new capabilities, supporting technologies and foundational research for affordable, sustainable human and robotic exploration;
- **Space Operations:** providing critical enabling technologies for much of the rest of NASA through the Space Shuttle, the International Space Station, and flight support;
- **Science:** exploring the Earth, moon, Mars, and beyond; charting the best route of discovery, and reaping the benefits of Earth and space exploration for society; and
- **Aeronautics Research:** conducting research that will enhance significantly aircraft performance, environmental compatibility, and safety, and that also will enhance the capacity, flexibility, and safety of the future air transportation system.

In addition, NASA has nine Business Line (Mission) Support Offices, including the Office of the Chief Financial Officer and Institutions & Management. The Agency's transformed structure includes a Strategic Management Council, an Operations Management Council and a Program Management Council to integrate NASA's strategic, tactical and operational decisions, and a number of new or reconstituted committees that support NASA's focus and direction. The transformed organizational structure is designed to streamline the Agency and position it to better implement the Vision for Space Exploration.

The nine NASA Centers, NASA Headquarters, and the Jet Propulsion Laboratory carry out the activities of the Mission Directorates. The Jet Propulsion Laboratory is a federally funded Research and Development Center owned by NASA but managed by an independent contractor.

The accompanying financial statements of NASA include the accounts of all funds which have been established and maintained to account for the resources under the control of NASA management.

Basis of Accounting and Presentation

These consolidated financial statements are prepared in accordance with generally accepted accounting principles (GAAP) in the United States of America as promulgated by the Federal Accounting Standards Advisory Board (FASAB) and the Office of Management and Budget (OMB) Circular A-136, Financial Reporting Requirements. FASAB is recognized by the American Institute of Certified Public Accountants (AICPA) as the official accounting standards-setting body of the United States government entities. The statements include the financial position, net cost of operations, changes in net position, budgetary resources, and financing of NASA, as required by the Chief Financial Officers Act of 1990 and the Government Management Reform Act of 1994.

The financial statements should be read with the realization they are a component of the U.S. government, a sovereign entity. One implication of this is that liabilities cannot be liquidated without legislation providing resources and legal authority to do so. The accounting structure of federal agencies is designed to reflect both accrual and budgetary accounting transactions. Under the accrual method of accounting, revenues are recognized when earned and expenses are recognized when a liability is incurred, without regard to receipt or payment of cash. Budgetary accounting facilitates compliance with legal constraints and controls over the use of federal funds.

Budgets and Budgetary Accounting

NASA follows standard Federal budgetary accounting policies and practices in accordance with OMB Circular A-11, Preparation, Submission and Execution of the Budget. Budgetary accounting facilitates compliance with legal constraints and controls over the use of Federal Funds. Congress funds NASA using three appropriations: Science, Aeronautics and Exploration; Exploration Capabilities; and Office of Inspector General.

NOTE 1. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

The Science, Aeronautics and Exploration appropriation supports the following Business Lines: Science; Exploration Systems; and Aeronautics Research. The Exploration Capabilities appropriation supports the Space Operations Business Line which includes the Space Station, Space Shuttle, and Space and Flight Support. The Office of Inspector General appropriation funds the audit and investigation activities of the Agency.

Reimbursements to NASA appropriations are used to fund agreements between the Agency and other federal entities or the public. As part of its reimbursable program, NASA launches devices into space and provides tracking and data relay services for the U.S. Department of Defense, the National Oceanic and Atmosphere Administration, and the National Weather Service.

Use of Estimates

The preparation of financial statements requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities as of the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from these estimates.

NASA requires major contractors to provide an estimate of their anticipated billing prior to their sending the actual invoice to the agency. In addition, NASA also requires the contractors to provide an estimate for the next month's anticipated work. When NASA receives these estimates they are compared to the contract under which the work is performed. If the estimate exceeds a specified funding line item the program manager and the procurement official, as necessary, review the estimate prior to posting in the general ledger as an estimated liability. If the review is not completed within the timeframe for quarterly or yearly reporting, the Agency uses the estimates of activity through the current period to establish an estimated liability, however, in this instance the agency fully recognizes that "no agency has the authority to pay liabilities not covered by budgetary resources." Liability to the contractor is not established by receipt of these estimates, but only when accepted by the Agency.

Fund Balance with Treasury

Treasury processes cash receipts and disbursements for NASA. Fund Balance with Treasury includes appropriated funds, trust funds, deposit funds, and budget clearing accounts.

Investments in U.S. Government Securities

Investments include the following Intragovernmental non-marketable securities:

(1) National Aeronautics and Space Administration Endeavor Teacher Fellowship Trust Fund established from public donations in tribute to the crew of the Space Shuttle Challenger.

(2) Science, Space and Technology Education Trust Fund established for programs to improve science and technology education.

Accounts Receivable

Most receivables are for reimbursement of research and development costs related to satellites and launch services. The allowance for uncollectible accounts is based upon evaluation of public accounts receivable, considering the probability of failure to collect based upon current status, financial and other relevant characteristics of debtors, and the relationship with the debtor. Under a cross-servicing agreement with the Department of Treasury, public accounts receivable over 180 days delinquent are turned over to Treasury for collection. The receivable remains on NASA's books until Treasury determines the receivable is uncollectible or the receivable is internally written off and closed out.

Inventory and Related Property

Inventory held by Centers and contractors that are repetitively procured, stored and issued on the basis of demand are considered Operating Materials and Supplies, a category of Inventory and Related Property. Certain NASA contractors' inventory management systems do not distinguish between items that should be classified as materials and those that should be classified as depreciable property. NASA reclassifies as property, all materials valued at $100,000 or greater, in support of large-scale assets such as the Space Shuttle and the International Space Station.

National Aeronautics and Space Administration
Notes to Financial Statements
(Fiscal Years 2006 and 2005 Are Unaudited)

NOTE 1. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES, CONTINUED

General Property, Plant and Equipment

The Agency and its contractors and grantees hold NASA-owned property, plant, and equipment. Property with a unit cost of $100,000 or more and a useful life of 2 years or more is capitalized; all other property is expensed when purchased. Capitalized costs include all costs incurred by NASA to bring the property to a form and location suitable for its intended use. Under provisions of the Federal Acquisition Regulation (FAR), contractors are responsible for control over accountability for Government-owned property in their possession. NASA's contractors and grantees report on NASA property in their custody annually and its top contractors report monthly.

Capitalized costs for internally developed software include the full costs (direct and indirect) incurred during the software development stage only. For purchased software, capitalized costs include amounts paid to vendors for the software and material internal costs incurred by the Agency to implement and make the software ready for use through acceptance testing. When NASA purchases software as part of a package of products and services (for example: training, maintenance, data conversion, reengineering, site licenses, and rights to future upgrades and enhancements), capitalized and non-capitalized costs of the package are allocated among individual elements on the basis of a reasonable estimate of their relative fair market values. Costs that are not susceptible to allocation between maintenance and relatively minor enhancements are expensed.

NASA capitalizes costs for internal use software when the total projected cost is $1,000,000 or more and the expected useful life of the software is 2 years or more. These Financial Statements report depreciation expense using the straight-line method.

NASA began depreciating the International Space Station in FY 2001 when manned by the first permanent crew. Only the Station's major elements in space are depreciated; any on-ground elements are reported as Assets Under Construction (AUC) until launched and incorporated into the existing Station structure.

Working Capital Fund

Congress established the NASA Working Capital Fund (WCF) during fiscal year 2003 with the enactment of the FY 2003 Appropriations Act (P.L. 108-7). The Department of Treasury established a unique account for NASA that same fiscal year. During FY 2006 the NASA WCF consisted of two entities: 1) a Government-Wide Acquisition Contract (GWAC) that provides the latest in Information Technology (IT) products. This provided a simplified process for obtaining high-end commercial IT hardware and software at favorable prices through volume buying. 2) An agency-wide Service Center, NASA Shared Services Center (NSSC).

NASA Shared Service Center

NASA Shared Services Center opened March 1, 2006 on the grounds of Stennis Space Center. The NSSC is a public/private partnership between NASA and Computer Sciences Corporation Service Providers. The mixed staff of civil service and contractor personnel, performs a variety of consolidated transactional and administrative activities that were once carried out at each NASA center and Headquarters. These functions consisted of responsibilities in the following areas: Financial Management (FM), Human Resources (HR), Information Technology (IT) and Procurement.

Liabilities Covered by Budgetary Resources

Liabilities covered by budgetary resources are liabilities that are covered by realized budgetary resources as of the balance sheet date. Realized budgetary resources include new budget authority, unobligated balances of budgetary resources at the beginning of the year, and spending authority from offsetting collections. Examples include accounts payable and salaries. Accounts Payable includes amounts recorded for the receipt of goods or services furnished.

Liabilities and Contingencies Not Covered by Budgetary Resources

Generally liabilities not covered by budgetary resources are liabilities for which Congressional action is needed before budgetary resources can be provided. Examples include the Federal Employees' Compensation Act (FECA) actuarial liability and contingencies.

Liabilities not covered by budgetary resources include certain environmental matters, legal claims, pensions and other retirement benefits (ORB), workers' compensation, annual leave, and closed appropriations.

NOTE 1. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES, CONTINUED

Reclassifications of 2005 Information

Certain reclassifications have been made to Fiscal Year 2005 financial statements and footnotes to conform to OMB's changes to Circular A-136 effective in Fiscal Year 2006.

Annual, Sick, and Other Leave

Annual leave is accrued as it is earned; the accrual is reduced as leave is taken. Each year, the balance in the accrued annual leave account is adjusted to reflect current pay rates. To the extent current or prior year appropriations are not available to fund annual leave earned but not taken, funding will be obtained from future financing sources. Sick leave and other types of non-vested leave are expensed as taken.

Federal Employee and Veterans' Benefits

Agency employees participate in the Civil Service Retirement System (CSRS), a defined benefit plan, or the Federal Employees Retirement System (FERS), a defined benefit and contribution plan. For CSRS employees, NASA makes contributions of 8.51 percent of pay. For FERS employees, NASA makes contributions of 10.7 percent to the defined benefit plan, contributes 1 percent of pay to a retirement saving plan (contribution plan), and matches employee contributions up to an additional 4 percent of pay. For FERS employees, NASA also contributes to employer's matching share for Social Security.

Statement of Federal Financial Accounting Standards No. 5, "Accounting for Liabilities of the Federal Government," require Government agencies to report the full cost of employee health benefits (FEHB), and the Federal Employees Group Life Insurance (FEGLI) Programs. NASA used the applicable cost factors and imputed financing sources from the Office of Personnel and Management Letter For Chief Financial Officers, dated August 16, 2004, in these Financial Statements.

Environmental and Disposal Liabilities

The Agency records a liability for environmental and disposal clean-up costs from NASA operations that resulted in contamination from waste disposal methods, leaks, spills, and other past activity that created a public health or environmental risk. These liabilities are assessed by the engineers and finance staff to be probable, reasonably possible or remote. Mid-year determinations are made of the status of these unfunded liabilities and year end updates are made for any changes up or down that exceed $200,000 and probable losses for which an estimate of remediation costs can be made are recorded. More details are also found in Note 10.

National Aeronautics and Space Administration
Notes to Financial Statements
(Fiscal Years 2006 and 2005 Are Unaudited)

NOTE 2. NON-ENTITY ASSETS
(In Millions of Dollars)

Non-Entity Assets are those assets that are held by NASA but are not available for use by NASA.

	2006	2005
Intragovernmental:		
Fund Balance with Treasury	$ 1	$ —
Accounts Receivable	2	5
Total Intragovernmental	**$ 3**	**$ 5**
Due from the Public:		
Accounts Receivable	—	11
Total Non-Entity Assets	3	16
Total Entity Assets	45,307	46,288
Total Assets	**$ 45,310**	**$ 46,304**

NOTE 3. FUND BALANCE WITH TREASURY
(In Millions of Dollars)

Fund Balance with Treasury balance is the aggregate amount of all NASA agency location codes (ALC) accounts at Treasury, for which the agency is authorized to make expenditures and pay liabilities. The fund types are trust, appropriated and other funds.

Trust Funds include balances in Endeavor Teacher Fellowship Trust Fund, National Space Grant Program, Science, Space and Technology Education Trust Fund, and Gifts and Donations.

Appropriated Funds include balances in Space Flight Capabilities, Science, Aeronautics, and Exploration, Mission Support, Human Space Flight, Science, Aeronautics, and Technology, and Office of Inspector General.

Other Fund types include Fines, Penalties, and Forfeitures, General Fund Proprietary Interest, Working Capital Fund, Collections of Receivables from Canceled Appropriations, General Fund Proprietary Receipts, Budget Clearing and Suspense, Unavailable Check Cancellation, Undistributed Intergovernmental Payment, State and Local Taxes, Other Payroll, and US Employee Allotment Account, Savings Bonds.

Fund Balances

	2006	2005
Trust Funds	$ 4	$ 4
Appropriated Funds	9,542	8,169
Working Capital Fund	33	—
Other Fund Types	6	(27)
Total	**$ 9,585**	**$ 8,146**

The status of Fund Balance with Treasury represents the total fund balance as reflected in the general ledger for unobligated and obligated balances. Unobligated Balances—Available represent the amount remaining in appropriation accounts that are available for obligation in future fiscal years. Unobligated Balances—Unavailable represent the amount remaining in appropriation accounts that can only be used for adjustments to previously recorded obligations. Obligated Balances—Not Yet Disbursed represent the cumulative amount of obligations incurred, including accounts payable and advances from reimbursable customers, for which outlays have not been made.

Status of Fund Balance with Treasury

	2006	2005
Unobligated Balance		
Available	$ 2,147	$ 2,077
Unavailable	190	161
Obligated Balance Not Yet Disbursed	7,247	5,937
Clearing and Deposit Accounts	1	(29)
Total	**$ 9,585**	**$ 8,146**

National Aeronautics and Space Administration
Notes to Financial Statements
(Fiscal Years 2006 and 2005 Are Unaudited)

NOTE 4. INVESTMENTS
(In Millions of Dollars)

Intragovernmental Securities are marketable federal securities bought and sold on the open market. The Bureau of the Public Debt issues non-marketable par value Treasury securities. The trust fund and cash balances are invested in Treasury securities, which are purchased and redeemed at par exclusively through Treasury's Federal Investment Branch. The effective-interest method was utilized to amortize discounts and premiums.

As of September 30, 2006

	Cost	Amortization Method	Unamortized (Premium) Discount	Investments, Net	Market Value Disclosure
Intragovernmental Securities:					
Non-Marketable:		Effective-interest			
Par Value	$ 14	0.0431-8.875%	$ 3	$ 17	$ 17
Total	**$ 14**		**$ 3**	**$ 17**	**$ 17**

As of September 30, 2005

	Cost	Amortization Method	Unamortized (Premium) Discount	Investments, Net	Market Value Disclosure
Intragovernmental Securities:					
Non-Marketable:		Effective-interest			
Par Value	$ 14	0.0298-8.875%	$ 3	$ 17	$ 17
Total	**$ 14**		**$ 3**	**$ 17**	**$ 17**

NOTE 5. ACCOUNTS RECEIVABLE, NET

(In Millions of Dollars)

The Accounts Receivable balance includes receivables for reimbursement of research and development costs related to satellites and launch services. The allowance for uncollectible accounts is based upon evaluation of public accounts receivables, considering the probability of failure to collect based upon current status, financial and other relevant characteristics of debtors, and the relationship with the debtor.

The Accounts Receivable for September 30, 2006 and 2005, consist of the following:

As of September 30, 2006

	Accounts Receivable	Allowance for Uncollectible Accounts	Net Amount Due
Intragovernmental	$ 180	$ —	$ 180
Public	6	(1)	5
Total	**$ 186**	**$ (1)**	**$ 185**

As of September 30, 2005

	Accounts Receivable	Allowance for Uncollectible Accounts	Net Amount Due
Intragovernmental	$ 136	$ —	$ 136
Public	61	(1)	60
Total	**$ 197**	**$ (1)**	**$ 196**

National Aeronautics and Space Administration
Notes to Financial Statements
(Fiscal Years 2006 and 2005 Are Unaudited)

NOTE 6. INVENTORY AND RELATED PROPERTY, NET
(In Millions of Dollars)

Operating Materials and Supplies, Held for Use are tangible personal property held by NASA and its contractors to be used for fabricating and maintaining NASA assets and used in normal operations. Operating Materials and Supplies, Held in Reserve for Future Use are tangible personal property held by NASA for emergencies for which there is no normal recurring demand but that must be immediately available to preclude delay, which might result in loss, damage or destruction of Government property, danger to life or welfare of personnel, or substantial financial loss to the Government due to an interruption of operations.

All materials are valued using historical costs, or other valuation methods that approximate historical cost. Excess operating materials and supplies are materials that exceed the demand expected in the normal course of operations, and do not meet management's criteria to be held in reserve for future use. Obsolete operating material and supplies are materials no longer needed due to changes in technology, laws, customs, or operations. Unserviceable operating materials and supplies are materials damaged beyond economic repair.

	September 30, 2006	September 30, 2005
Inventory and Related Property, Net		
Operating Materials and Supplies		
Items Held for Use	$ 2,687	$ 3,401
Items Held in Reserve for Future Use	3	3
Excess, Obsolete, and Unserviceable	(360)	(385)
Total	**$ 2,330**	**$ 3,019**

NOTE 7. GENERAL PROPERTY, PLANT, AND EQUIPMENT, NET

(In Millions of Dollars)

Theme Assets consist of assets specifically designed for use in a NASA program. Equipment includes special tooling, special test equipment, and Agency-peculiar property, such as the Space Shuttle and other configurations of spacecraft: engines, satellites, rockets, and other scientific components unique to NASA space programs. Structures, Facilities, and Leasehold Improvements include buildings with collateral equipment, and capital improvements, such as airfields, power distribution systems, flood control, utility systems, roads, and bridges. NASA also has use of certain properties at no cost. These properties include land at the Kennedy Space Center withdrawn from the public domain, land, and facilities at the Marshall Space Flight Center under a no cost 99-year lease with the U.S. Department of the Army. Work-in-Process (WIP) includes equipment and facilities that are being constructed. WIP includes the fabrication of assets that may or may not be capitalized once completed and operational. Projects that do not meet the capitalization criteria of two years of useful life and in excess of $100,000 are expensed. All other project costs are capitalized in the year placed into operation.

NASA has International Space Station bartering agreements with international agencies including the European Space Agency and the National Space Agency of Japan. NASA barters with these space agencies to obtain International Space Station hardware elements in exchange for providing goods and services such as Space Shuttle transportation and a share of NASA's International Space Station utilization rights. The intergovernmental agreements state that the parties will seek to minimize the exchange of funds in the cooperative program, including the use of barters to provide goods and services. As of September 30, 2006, NASA has received some assets from these parties in exchange for future services. The fair value is indeterminable; therefore no value was ascribed to these transactions in accordance with APB No. 29. Accounting for Nonmonetary Transactions. Under all agreements to date, NASA's International Space Station Program's International Partners Office expects that NASA will eventually receive future NASA-required elements as well with no exchange of funds.

Prior to fiscal year 2006, President Bush announced a new vision for the Nation's space exploration program. Implementation of this initiative has required NASA to prioritize and restructure existing programs and missions, and to phase out or eliminate sooner than originally planned some programs and missions. These programs and missions include the Shuttle, which was originally planned to continue to the year 2020 but now will retire as soon as assembly of the International Space Station is completed (planned for the end of this decade). NASA will make an announcement in early FY 2007 regarding the future of planned servicing missions to the Hubble Space Telescope.

Management is exploring whether a significant portion of PP&E costs should be classified as research and development and therefore should be expensed. NASA is considering a change in its accounting policy for Theme Assets to reclassify some Theme Asset costs previously categorized as General Property, Plant, and Equipment (PP&E) as Research and Development (R&D) expenses. In the development of the revised policy, NASA followed standards established by the Financial Accounting Standards Board (FASB) in its Statement of Financial Accounting Standards No. 2, Accounting for Research and Development Costs. NASA believes that this change will result in financial reporting that is more relevant and timely to the readers of its financial statements. NASA requested that FASAB clarify the accounting standards the Agency used as the basis for its draft change in accounting policy. NASA anticipates a response from FASAB in FY 2007.

National Aeronautics and Space Administration
Notes to Financial Statements
(Fiscal Years 2006 and 2005 Are Unaudited)

NOTE 7. GENERAL PROPERTY, PLANT, AND EQUIPMENT, NET (CONTINUED)

(In Millions of Dollars)

September 30, 2006

	Depreciation Method	Useful Life	Cost	Accumulated Depreciation	Book Value
Government-owned/Government-held					
Land			$ 114	$ —	$ 114
Structures, Facilities and Leasehold Improvements	Straight-line	15–40 years	5,497	(4,082)	1,415
Theme Assets	Straight-line	2–20 years	43,593	(29,142)	14,451
Equipment	Straight-line	5–25 years	2,267	(1,644)	623
Internal Use Software and Development	Straight-line	5 years	139	(49)	90
Work-in-Process (WIP)					
Work-in-Process			204	—	204
Work-in-Process—Equipment			26	—	26
Assets Under Construction			8,198	—	8,198
Total			**$ 60,038**	**$ (34,917)**	**$ 25,121**
Government-owned/Contractor-held					
Land			$ 8	$ —	$ 8
Structures, Facilities and Leasehold Improvements	Straight-line	15–40 years	859	(704)	155
Equipment	Straight-line	5–25 years	12,264	(9,155)	3,109
Work-in-Process			4,800	—	4,800
Total			**$ 17,931**	**$ (9,859)**	**$ 8,072**
Total Property, Plant, and Equipment			**$ 77,969**	**$ (44,776)**	**$ 33,193**

NOTE 7. GENERAL PROPERTY, PLANT, AND EQUIPMENT, NET (CONTINUED)

(In Millions of Dollars)

September 30, 2005

	Depreciation Method	Useful Life	Cost	Accumulated Depreciation	Book Value
Government-owned/Government-held					
Land			$ 114	$ —	$ 114
Structures, Facilities and Leasehold Improvements	Straight-line	15–40 years	5,567	(4,008)	1,559
Theme Assets	Straight-line	2–20 years	42,121	(25,699)	16,422
Equipment	Straight-line	5–25 years	2,109	(1,483)	626
Capitalized Leases	Straight-line	5–25 years	2	(1)	1
Internal Use Software and Development	Straight-line	5 years	89	(26)	63
Work-in-Process (WIP)					
Work-in-Process			199	—	199
Work-in-Process—Equipment			26	—	26
Assets Under Construction			6,953	—	6,953
Total			**$ 57,180**	**$ (31,217)**	**$ 25,963**
Government-owned/Contractor-held					
Land			$ 8	$ —	$ 8
Structures, Facilities and Leasehold Improvements	Straight-line	15–40 years	831	(628)	203
Equipment	Straight-line	5–25 years	10,921	(8,422)	2,499
Work-in-Process			6,253	—	6,253
Total			**$ 18,013**	**$ (9,050)**	**$ 8,963**
Total Property, Plant, and Equipment			**$ 75,193**	**$ (40,267)**	**$ 34,926**

National Aeronautics and Space Administration
Notes to Financial Statements
(Fiscal Years 2006 and 2005 Are Unaudited)

NOTE 8. LIABILITIES NOT COVERED BY BUDGETARY RESOURCES

(In Millions of Dollars)

Liabilities not covered by budgetary resources are liabilities for which Congressional action is needed before budgetary resources can be provided. They include certain environmental matters (Note 10), legal claims, pensions and other retirement benefits, workers' compensation, annual leave, and closed appropriations.

A liability was recorded for workers' compensation claims related to the Federal Employees' Compensation Act (FECA), administered by U.S. Department of Labor. The FECA provides income and medical cost protection to covered Federal civilian employees injured on the job, employees who have incurred a work-related occupational disease, and beneficiaries of employees whose death is attributable to a job-related injury or occupational disease. The FECA Program initially pays valid claims and subsequently seeks reimbursement from the Federal agencies employing the claimants.

The FECA liability includes the actuarial liability for estimated future costs of death benefits, workers' compensation, and medical and miscellaneous costs for approved compensation cases. The present value of these estimates at the end of fiscal year was calculated by the Department of Labor using a discount rate. This liability does not include the estimated future costs for claims incurred but not reported or approved as of the end of each year.

Fiscal Year	Discount Rate
2006	5.170%
2005	4.528%

NASA has recorded Accounts Payable related to closed appropriations for which there are contractual commitments to pay. These payables will be funded from appropriations available for obligation at the time a bill is processed, in accordance with Public Law 101-510.

	2006	2005
Intragovernmental Liabilities:		
Other Liabilities		
Workers' Compensation	$ 15	$ 15
Accounts Payable for Closed Appropriations	6	2
Total Intragovernmental	**$ 21**	**$ 17**
Public Liabilities:		
Accounts Payable		
Accounts Payable for Closed Appropriations	104	117
Federal Employee and Veterans Benefits		
Actuarial FECA Liability	60	62
Environmental and Disposal Liabilities	893	825
Other Liabilities		
Unfunded Annual Leave	179	171
Contingent Liabilities	4	5
Total from the Public	**$ 1,240**	**$ 1,180**
Total Liabilities Not Covered by Budgetary Resources	$ 1,261	$ 1,197
Total Liabilities Covered by Budgetary Resources	2,052	2,286
Total Liabilities	**$ 3,313**	**$ 3,483**

NOTE 9. OTHER LIABILITIES
(In Millions of Dollars)

In FY 2006, NASA updated the format of this footnote to reflect changes made to the financial statement crosswalks issued by the Department of Treasury. In prior fiscal years, balances reported as Accounts Payable for Canceled Appropriations were reported on the Other Liabilities line of the Balance Sheet. This amount is currently reported on the Accounts Payable line of the Balance Sheet. Additionally, in previous fiscal years Actuarial FECA Liability was reported on the Balance Sheet line Other Liabilities. Currently, this amount is reported as separate line item on the Balance Sheet.

The format change from the September 30, 2005 published number was made to allow comparative data between 2005 and 2006.

September 30, 2006

	Current	Non-Current	Total
Intragovernmental Liabilities			
Advances from Others	$ 114	$ —	$ 114
Workers' Compensation	15	—	15
Employer Contributions and Payroll Taxes	11	—	11
Liability for Deposit and Clearing Funds	14	—	14
Custodial Liability	8	—	8
Other Liabilities	(5)	—	(5)
Total Intragovernmental	**$ 157**	**$ —**	**$ 157**
Liabilities from the Public			
Unfunded Annual Leave	$ —	$ 179	$ 179
Employer Contributions and Payroll Taxes	17	—	17
Accrued Funded Payroll	70	—	70
Advances from Others	87	—	87
Contract Holdbacks	1	—	1
Custodial Liability	(17)	—	(17)
Other Accrued Liabilities	23	—	23
Contingent Liabilities	—	4	4
Liability for Deposit and Clearing Funds	(14)	—	(14)
Other Liabilities	5	—	5
Total from the Public	**$ 172**	**$ 183**	**$ 355**
Total Other Liabilities	**$ 329**	**$ 183**	**$ 512**

National Aeronautics and Space Administration
Notes to Financial Statements
(Fiscal Years 2006 and 2005 Are Unaudited)

NOTE 9. OTHER LIABILITIES (CONTINUED)

(In Millions of Dollars)

September 30, 2005 (Restated)

	Current	Non-Current	Total
Intragovernmental Liabilities			
Advances from Others	$ 99	$ —	$ 99
Workers' Compensation	(1)	16	15
Employer Contributions and Payroll Taxes	10	—	10
Liability for Deposit and Clearing Funds	—	—	—
Custodial Liability	5	—	5
Other Liabilities	(5)	—	(5)
Total Intragovernmental	**$ 108**	**$ 16**	**$ 124**
Liabilities from the Public			
Unfunded Annual Leave	$ —	$ 171	$ 171
Employer Contributions and Payroll Taxes	6	—	6
Accrued Funded Payroll	71	—	71
Advances from Others	62	—	62
Contract Holdbacks	1	—	1
Custodial Liability	11	—	11
Other Accrued Liabilities	27	—	27
Contingent Liabilities	—	5	5
Liability for Deposit and Clearing Funds	(20)	—	(20)
Other Liabilities	6	—	6
Total from the Public	**$ 164**	**$ 176**	**$ 340**
Total Other Liabilities	**$ 272**	**$ 192**	**$ 464**

NOTE 10. ENVIRONMENT AND DISPOSAL LIABILITIES

(In Millions of Dollars)

Environmental and Disposal Liabilities represent cleanup costs from NASA operations that resulted in contamination from waste disposal methods, leaks, spills, and other past activity that created a public health or environmental risk. Federal, State, and local statutes and regulations require environmental cleanup costs. Some of these statutes are the Comprehensive Environmental Response, Compensation, and Liability Act; the Resource Conservation and Recovery Act; the Nuclear Waste Policy Act of 1982; and State and local laws.

Where up-to-date-site-specific engineering estimates for cleanup are not available, NASA employs commercially available parametric modeling software to estimate the total cost of cleaning up known contamination at these sites for current and future years. Several NASA centers have potential remediation issues that are not at this time measurable or estimable.

NASA recorded an unfunded liability in its financial statements to reflect the estimated total cost of environmental cleanup. This estimate could change in the future due to identification of additional contamination, inflation, deflation, and a change in technology or applicable laws and regulations as well as through ordinary liquidation of these liabilities as the cleanup program continues into the future. The estimate changed from FY 2005 to FY 2006 largely due to better information being available on the extent of contamination and remediation efforts that would be required. The estimate represents an amount that NASA expects to spend to remediate currently known contamination, subject to the availability of appropriated funds. Other responsible parties that may be required to contribute to the remediation funding could share this liability.

	FY 2006	FY 2005
Environmental Liabilities	$ 893	$ 825
Total Environmental Cleanup	**$ 893**	**$ 825**

In addition to the specific remediation efforts contemplated in the above estimates, NASA has a number of other potential remediation sites. For certain such sites, remediation costs ranging from $7 million to $65 million have been estimated as reasonably possible. Beyond acknowledging that such costs would be significant, for such other sites, management is not currently able to estimate the range of loss, or assess the likelihood that remediation efforts will be required.

National Aeronautics and Space Administration
Notes to Financial Statements
(Fiscal Years 2006 and 2005 Are Unaudited)

NOTE 11. CONTINGENT LIABILITIES
(In Millions of Dollars)

No balances have been recorded in the financial statements for contingencies related to proceedings, actions, and claims where management and legal counsel believe that it is possible but not probable that some costs will be incurred. There were certain cases that the lawyers reviewed and determined a loss was probable but could not estimate the amount of a future loss.

NASA is a party in various administrative proceedings, court actions (including tort suits), and claims brought by or against it. In the opinion of management and legal counsel, the ultimate resolution of these proceedings, actions, and claims will not materially affect the financial position, net cost, changes in net position, budgetary resources, or financing of NASA. Liabilities have been recorded for $4 million and $5 million for these matters as of September 30, 2006 and September 30, 2005, respectively.

NOTE 12. INTRAGOVERNMENTAL COST AND EXCHANGE REVENUE
(In Millions of Dollars)

Intragovernmental costs and revenue are exchange transactions made between NASA and another Federal Government reporting entity. Costs and revenue with the Public result from transactions between NASA and a non-Federal entity. No comparison is available to the prior fiscal year due to a change in the data structure and a new method had not been established to format the information for disclosure for financial reporting. In August of 2004, NASA restructured from six strategic Enterprises to four Mission Directorates. The transformation did not provide sufficient lead time to develop the reporting structure in the financial management system for FY 2005.

	2006
Science	
Intragovernmental Costs	$ 536
Public Cost	6,092
Total Science Costs	6,628
Intragovernmental Earned Revenue	350
Public Earned Revenue	(2)
Total Science Earned Revenue	348
Total Science Net Cost	**$ 6,280**
Exploration Systems	
Intragovernmental Costs	$ 214
Public Cost	2,490
Total Exploration Systems Costs	2,704
Intragovernmental Earned Revenue	89
Public Earned Revenue	(1)
Total Exploration Systems Earned Revenue	88
Total Exploration Systems Net Cost	**$ 2,616**
Aeronautics Research	
Intragovernmental Costs	$ 81
Public Cost	1,048
Total Aeronautics Research Costs	1,129
Intragovernmental Earned Revenue	63
Public Earned Revenue	16
Total Aeronautics Research Earned Revenue	79
Total Aeronautics Research Net Cost	**$ 1,050**

National Aeronautics and Space Administration
Notes to Financial Statements
(Fiscal Years 2006 and 2005 Are Unaudited)

NOTE 12. INTRAGOVERNMENTAL COST AND EXCHANGE REVENUE (CONTINUED)

(In Millions of Dollars)

	2006
Space Operations	
Intragovernmental Costs	$ 482
Public Cost	7,638
Total Space Operations Costs	8,120
Intragovernmental Earned Revenue	408
Public Earned Revenue	16
Total Space Operations Earned Revenue	424
Total Space Operations Earned Net Cost	**$ 7,696**
Net Cost of Operations	**$ 17,642**

NOTE 13. UNDELIVERED ORDERS AT THE END OF THE PERIOD
(In Millions of Dollars)

Undelivered Orders at the end of the period total $5,822 million and $4,364 million as of September 30, 2006 and September 30, 2005, respectively. In previous fiscal years this amount was reported as a line item on the Statement of Budgetary Resources. Based on reporting changes as required by OMB A-136, undelivered orders is no longer reported on the statement. A footnote disclosure for total undelivered orders is required to comply with requirements of SFFAS 7.

Due to conversion differences in FY 2003, FACTS II unpaid obligations brought forward were adjusted by $39 million in the current fiscal year. This adjustment is carried through the FY 2006 actual column of the Program and Financing Schedules reported in the FY 2008 Budget of the U.S. Government. Such information agrees with the related financial records and related data.

NOTE 14. APPORTIONMENT CATEGORIES OF OBLIGATIONS INCURRED
(In Millions of Dollars)

Category A consists of amounts requested to be apportioned for each calendar quarter in the fiscal year. Category B consists of amounts requested to be apportioned on a basis other than calendar quarters, such as time periods other than quarters, activities, projects, objects, or a combination thereof.

	FY 2006	FY 2005
Direct Obligations:		
Category A	$ 1	$ 1
Category B	16,767	16,978
Reimbursable Obligations:		
Category B	1,005	1,019
Total Obligations Incurred	**$ 17,773**	**$ 17,998**

NOTE 15. EXPLANATION OF DIFFERENCES BETWEEN THE SBR AND THE BUDGET OF THE U.S. GOVERNMENT
(In Millions of Dollars)

NASA compared the amounts reported on the Statement of Budgetary Resources and the actual amounts reported in the Budget of the United States Government as required by SFFAS No. 7 for FY 2005 and identified no material differences.

The Budget of the United States Government with actual amounts from FY 2006 was not published as of November 15, 2006. The comparison for FY 2006 will be performed when the Budget of the United States Government is published.

NOTE 16. EXPLANATION OF DIFFERENCES BETWEEN LIABILITIES NOT COVERED BY BUDGETARY RESOURCES AND COMPONENTS REQUIRING OR GENERATING RESOURCES IN FUTURE PERIODS
(In Millions of Dollars)

Liabilities Not Covered by Budgetary Resources of $1,261 and $1,197 as of September 30, 2006 and September 30, 2005, respectively, represent NASA's environmental liability, FECA liability to Department of Labor and employees, contingent liabilities, accounts payable for closed appropriations and leave earned but not taken (See Note 8, Liabilities Not Covered by Budgetary Resources). Only a portion of these liabilities will require or generate resources in future periods.

National Aeronautics and Space Administration
Notes to Financial Statements
(Fiscal Years 2006 and 2005 Are Unaudited)

NOTE 17. STEWARDSHIP PP&E

(In Millions of Dollars)

Federal agencies are required to classify and report heritage assets, in accordance with the requirements of SFFAS No. 29, Heritage Assets and Stewardship Land.

Heritage Assets are property, plant, and equipment that possess one or more of the following characteristics: historical or natural significance; cultural, educational, or aesthetic value; or significant architectural characteristics.

Since the cost of heritage assets is usually not determinable, NASA does not value them or establish minimum value thresholds for designation of property, plant, or equipment as heritage assets. Additionally, the useful lives of heritage assets are not reasonably estimable for depreciation purposes. Since the most relevant information about heritage assets is their existence, they are qualified in terms of physical units, as follows:

	2005	Additions	Withdrawals	2006
Buildings and Structures	37	—	5	32
Air and Space Displays and Artifacts	492	4	—	496
Art and Miscellaneous Items	1,021	3	—	1,024
Total Heritage Assets	1,550	7	5	1,552

Heritage Assets were generally acquired through construction by NASA or its contractors, and are expected to remain in this category, except where there is legal authority for transfer or sale. Heritage assets are generally in fair condition, suitable only for display.

Many of the buildings and structures are designated as National Historic Landmarks. Numerous air and spacecraft and related components are on display at various locations to enhance public understanding of NASA programs. NASA eliminated their cost from its property records when they were designated as heritage assets. A portion of the amount reported for deferred maintenance is for heritage assets.

For more than 30 years, the NASA Art Program has documented America's major accomplishments in aeronautics and space. During that time, artists have generously contributed their time and talent to record their impressions of the U.S. Aerospace Program in paintings, drawings, and other media. Not only do these art works provide a historic record of NASA projects, they give the public a new and fuller understanding of advancements in aerospace. Artists give a special view of NASA through the back door. Some have witnessed astronauts in training or scientists at work. The art collection, as a whole, depicts a wide range of subjects, from Space Shuttle launches to aeronautics research, Hubble Space Telescope, and even virtual reality.

Artists commissioned by NASA receive a small honorarium in exchange for donating a minimum of one piece to the NASA archive. In addition, more works have been donated to the National Air and Space Museum.

In accordance with SFFAS No. 29 the cost of acquisition, improvement, reconstruction, or renovation of heritage assets is expensed in the period incurred.

In accordance with SFFAS No. 29, heritage assets that are used in day-to-day government operations are considered "multi-use" heritage assets that are not used for heritage purposes. Such assets are accounted for as general property, plant, and equipment and are capitalized and depreciated in the same manner as other general property, plant, and equipment. NASA has 45 buildings and structures that are considered to be multi-use heritage assets. The values of these assets are included in the property, plant, and equipment values shown in the Financial Statements.

National Aeronautics and Space Administration
Notes to Financial Statements
(Fiscal Years 2006 and 2005 Are Unaudited)

NOTE 18. GENERAL INFORMATION

(In Millions of Dollars)

During fiscal year 2003, NASA replaced ten disparate accounting systems and over 120 ancillary subsystems that had been in operation at our Centers for the past two decades, with a commercial off-the-shelf, Agency-wide, Integrated Financial Management system (SAP Core Financials application module).

Due to data anomalies in the FY 2003 conversion and known system limitations, NASA made a decision not to make prior period adjustments in fiscal years 2004 and 2005, and accordingly, processed all corrections in current year operations.

During fiscal year 2006, management recorded as current year expenses prior years property transactions for such items as equipment found during routine inventory processes, components of buildings removed and no longer in use, and the correction of manual processing errors.

In FY 2006, NASA continued to resolve a number of known reconciling items. Some resolutions required processing corrective transactions in the financial management system that impact line items on the financial statements.

National Aeronautics and Space Administration
Required Supplementary Stewardship Information
(Fiscal Years 2006 and 2005 Are Unaudited)
Stewardship Investments: Research and Development
For the Fiscal Year Ended September 30, 2006
(In Millions of Dollars)

Research and Development Expenses by Business Lines

In August 2004, NASA restructured from six strategic Enterprises to four Business Lines: Science, Exploration Systems, Aeronautics Research and Space Operations. Each Business Line is comprised of multiple themes and numerous programs comprise each theme. NASA's former enterprise structure has been mapped to the new Business Line structure and NASA will report Research and Development (R&D) expenses using the new structure. Therefore, R&D expenses will now be reported on a Program not Enterprise basis. This is NASA's first year reporting under this new structure. A description of NASA's R&D programs accompanies this reporting.

To provide the reader with a full picture of NASA expenses, both R&D and non-R&D, NASA has included expenses for non R&D costs associated with NASA activities such as Education and Outreach, Space Operations Programs. Descriptions for the work associated with these costs also accompany this reporting.

National Aeronautics and Space Administration
Required Supplementary Stewardship Information
(Fiscal Years 2006 and 2005 Are Unaudited)
Stewardship Investments: Research and Development
For the Fiscal Year Ended September 30, 2006
(In Millions of Dollars)

Research and Development Expenses by Business Line by Theme by Program

	2006
Science	
Solar System Exploration	
Discovery	$ 127
New Frontiers	107
Technology	1,280
Deep Space Mission Systems (DSMS)	187
Solar System Research	321
Mars Exploration	599
Solar System Exploration Total	**$ 2,621**
The Universe	
Navigator	$ 87
James Webb Space Telescope	315
Hubble Space Telescope	452
Gamma-ray Large Space Telescope (GLAST)	87
Discovery	114
Explorer	58
Universe Research	225
International Space Science Collaboration	6
Beyond Einstein	8
The Universe Total	**$ 1,352**
Earth–Sun System	
Earth Systematic Missions	$ 293
Living with a Star	257
Solar Terrestrial Probes	95
Explorer Program	114
Earth System Science Pathfinder	104
Earth–Sun System Multi-Mission Operations	290
Earth–Sun Research	926
Applied Sciences	48
Earth–Sun Technology	82
Earth–Sun System Total	**$ 2,209**
Science Total	**$ 6,182**

National Aeronautics and Space Administration
Required Supplementary Stewardship Information
(Fiscal Years 2006 and 2005 Are Unaudited)
Stewardship Investments: Research and Development (Continued)
For the Fiscal Year Ended September 30, 2006
(In Millions of Dollars)

Research and Development Expenses by Business Line by Theme by Program (Continued)

	2006
Exploration Systems	
Constellation Systems	
Earth Orbit Capability	$ 1,421
Constellations Systems Total	**$ 1,421**
Exploration Systems Research & Technology	
Advanced Space Technology	3
Technology Maturation	111
Robotic Lunar Exploration	95
Exploration Systems Research & Technology Total	**$ 209**
Prometheus Nuclear Systems & Technology	
Advanced Systems and Technology	291
Nuclear Flight Systems	24
Prometheus Systems Research & Technology Total	**$ 315**
Human Systems Research & Technology	
Life Support & Habitation	361
Human Health & Performance	136
Human Systems Integration	174
Human Systems Research & Technology Total	**$ 671**
Exploration Systems Total	**$ 2,616**
Aeronautics	
Aeronautics Technology	
Aviation Safety Program	152
Airspace Systems	144
Fundamental Aeronautics	754
Aeronautics Technology Total	**$ 1,050**
Aeronautics Total	**$ 1,050**
Total Research & Development Expenses	**$ 9,848**

National Aeronautics and Space Administration
Required Supplementary Stewardship Information
(Fiscal Years 2006 and 2005 Are Unaudited)
Stewardship Investments: Research and Development (Continued)
For the Fiscal Year Ended September 30, 2006
(In Millions of Dollars)

Non-Research and Development Expenses by Business Line by Theme by Program

	2006
Science	
Earth–Sun System	
Education and Outreach	$ 40
SOFIA	58
Science Total	**$ 98**
Space Operations	
Space Shuttle	4,245
International Space Station	1,708
Space and Flight Support (SFS)	1,743
Space Operations Total	**$ 7,696**
Total Non-Research & Development Expenses	**$ 7,794**
Total Expenses	**$ 17,642**

National Aeronautics and Space Administration
Required Supplementary Stewardship Information
(Fiscal Years 2006 and 2005 Are Unaudited)
Stewardship Investments: Research and Development (Continued)
For the Fiscal Year Ended September 30, 2006
(In Millions of Dollars)

NASA makes substantial research and development investments for the benefit of the United States. These amounts are expensed as incurred in determining the net cost of operations.

NASA's research and development programs include activities to extend our knowledge of Earth, its space environment, and the universe, and to invest in new aeronautics and advanced space transportation technologies that support the development and application of technologies critical to the economic, scientific, and technical competitiveness of the United States.

Investment in research and development refers to those expenses incurred to support the search for new or refined knowledge and ideas and for the application or use of such knowledge and ideas for the development of new or improved products and processes with the expectation of maintaining or increasing national economic productive capacity or yielding other future benefits. Research and development is composed of the following:

Basic Research: Systematic study to gain knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications toward processes or products in mind;

Applied Research: Systematic study to gain knowledge or understanding necessary for determining the means by which a recognized and specific need may be met; and

Development: Systematic use of the knowledge and understanding gained from research for the production of useful materials, devices, systems or methods, including the design and development of prototypes and processes.

Business Line Theme and Program Descriptions

BUSINESS LINE: SCIENCE

Theme: Solar System Exploration
The Solar System Exploration (SSE) Theme seeks to understand how the solar system formed and evolved, and whether there might be life in the solar system beyond Earth.

Program: Discovery
NASA's Discovery program represents a breakthrough in the way NASA explores space, with lower-cost, highly focused planetary science investigations designed to enhance our understanding of the solar system.

Program: New Frontiers
The New Frontiers program, a class of competed medium-sized missions, represents a critical step in the advancement of the solar system exploration. Proposed science targets for the New Frontiers program include Pluto and the Kuiper Belt, Jupiter, Venus, and sample returns from Earth's Moon and a comet nucleus.

Program: Technology
Robotic spacecraft use electrical power for propulsion, data acquisition, and communication to accurately place themselves in orbit around and onto the surfaces of bodies about which we may know relatively little. These systems ensure that they survive and function in hostile and unknown environments, acquire and transmit data throughout their lifetimes, and sometimes transport samples back to Earth. Since successful completion of these missions is so dependent on power, the future SSE portfolio of missions will demand advances in power and propulsion systems.

Program: Deep Space Mission System (DSMS)
This program seeks to enable NASA exploration, both human and robotic, of the solar system and beyond by providing reliable, high performance, and cost effective telecommunications and navigation services to its lunar and deep space missions.

Program: Solar Systems Research
The Solar System Exploration (SSE) Research Program develops the theoretical tools and laboratory data needed to analyze flight data, makes possible new and better instruments to fly on future missions, and analyzes the data returned so that SSE can answer specific questions posed and fit this new knowledge into the overall picture of the solar system.

Program: Mars Exploration

The Mars Exploration Program has been developed to conduct a rigorous, incremental, discovery-driven exploration of Mars to determine the planet's physical, dynamic, and geological characteristics, investigate the Martian climate in the context of understanding habitability, and investigate whether Mars ever had the potential to develop and harbor any kind of life.

Theme: The Universe

The Universe Theme supports NASA's mission to "explore the universe and search for life" by attempting to understand the origin and evolution of life, searching for evidence of life elsewhere and exploring the universe beyond.

Program: Navigator

The Navigator program consists of a coherent series of increasingly challenging projects, each complementary to the others and each mission building on the results and capabilities of those that preceded it as NASA searches for habitable planets outside of the solar system.

Program: The James Webb Space Telescope (JWST)

The program identified by the National Research Council as the top priority for astronomy and physics for the current decade—is a large, deployable infrared astronomical space-based observatory. The mission is a logical successor to the HST, extending beyond Hubble's discoveries into the infrared, where the highly redshifted early universe must be observed, where cool objects like protostars and protoplanetary disks emit strongly, and where dust obscures shorter wavelengths.

Program: Hubble Space Telescope

Since 1990, the HST has used its pointing precision, powerful optics, and state-of-the-art instruments to explore the visible, ultraviolet and near-infrared regions of the electromagnetic spectrum. Until such time that Hubble is no longer able to carry out its scientific mission, the observatory will continue to investigate the formation, structure, and evolution of stars and galaxies, studying the history of the universe, and providing a space-based research facility for optical astronomy.

Hubble development funding supports a suite of life extension activities, which will maximize science return as the telescope's capabilities degrade over time. In addition, a robotic spacecraft is under development to be launched on an expendable launch vehicle, rendezvous with HST, and safely deorbit the observatory at the end of its useful science life. While this development activity is underway, modification and upkeep of ground operations systems will continue.

Program: Gamma-ray Large Area Space Telescope (GLAST)

A collaboration with the Department of Energy, France, Italy, Sweden, Japan, and Germany, the Gamma-ray Large Area Space Telescope (GLAST) will improve researchers' understanding of the structure of the universe, from its earliest beginnings to its ultimate fate. By measuring the direction, energy, and arrival time of celestial high-energy gamma rays, GLAST will map the sky with 50 times the sensitivity of previous missions, with corresponding improvements in resolution and coverage. Yielding new insights into the sources of high-energy cosmic gamma rays, GLAST will reveal the nature of astrophysical jets and relativistic flows and study the sources of gamma-ray bursts.

Program: Discovery

The Discovery program gives scientists the opportunity to dig deep into their imaginations and find innovative ways to unlock the mysteries of the solar system. Discovery is an ongoing program that offers the scientific community the opportunity to assemble a team and design exciting, focused science investigations that complement NASA's larger planetary science explorations.

Program: Explorer

The Explorer program provides frequent flight opportunities for world-class astrophysics and space physics investigations, utilizing innovative, streamlined and efficient management approaches to spacecraft development and operations. The program (including Future Explorers) is managed within the Earth–Sun Theme, but selected projects are managed under the Universe Theme.

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Stewardship Investments: Research and Development (Continued)
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Program: Universe Research

The Universe Theme's Research program strives to answer critical questions about the nature of the universe with a host of operating missions led by investigators from academia and industry, as well as funding grants for basic research, technology development, and data analysis from past and current missions. All data collected by missions are archived in data centers located at universities and NASA centers throughout the country.

Program: International Space Science Collaboration (SSC)

Herschel and Planck, two projects in the International Space Science Collaboration (SSC) Program, are European Space Agency (ESA)-led missions. Herschel has been designed to unveil a face of the early universe that has remained hidden until now. Planck will help provide answers to one of the most important sets of questions asked in modern science: how did the universe begin, how did it evolve to the state we observe today, and how will it continue to evolve in the future?

Program: Beyond Einstein

Beyond Einstein (BE) flagship missions are the Laser Interferometer Space Antenna (LISA) & Constellation-X (Con-X). LISA, a joint effort NASA/ESA effort, will be the first space-based gravitational wave observatory. LISA will study the death spirals of stars, colliding black holes, and echoes from the universe all the way back to the Big Bang. Con-X will be a combination of several separate spacecraft working in unison as 1 giant X-ray telescope far more powerful than any previous. Con-X will investigate black holes, galaxy formation, the evolution of the universe on the largest scales, the recycling of matter and energy, and the nature of "dark matter."

Theme: Earth–Sun System

NASA uses the unique vantage point of space to understand and explore Earth and the Sun. The relationship between the Sun and the Earth is at the heart of a complex, dynamic system that researchers do not yet fully understand. The Earth–Sun system, like the human body, is comprised of diverse components that interact in complex ways, requiring unique capabilities for characterizing, understanding, and predicting change. Therefore, researchers need to understand the Sun, the heliosphere, and Earth's atmosphere, lithosphere, hydrosphere, cryosphere, and biosphere as a single connected system.

Program: Earth Systematic Missions

Earth Systematic Missions provide Earth observing satellites that contribute to the provision of long-term environmental data sets that can be used to study the evolution of the Earth system on a range of temporal scales. This information is used to analyze, model, and improve understanding of the Earth system.

Program: Living with a Star

The Living With a Star (LWS) program seeks to understand how and why the Sun varies, how Earth and other planets respond, and how the variability and response affect humanity. Achieving these goals will enable a reliable space weather prediction so undesirable space weather effects can be accommodated or mitigated before they occur.

Program: Solar Terrestrial Probes (STP)

The primary goal of the Solar Terrestrial Probes (STP) Program is to understand how the Sun, heliosphere, and planetary environments are connected in a single system.

Program: Explorer

The mission of the Explorer program is to provide frequent flight opportunities for world-class astrophysics and space physics investigations, utilizing innovative, streamlined and efficient management approaches to spacecraft development and operations.

Program: Earth System Science Pathfinder (ESSP)

This program addresses unique, specific, highly-focused mission requirements in Earth science research. ESSP includes a series of relatively low to moderate cost, small to medium sized, competitively selected, principal investigator led missions that are built, tested, and launched in a short time interval. These missions are capable of supporting a variety of scientific objectives related to Earth science, involving the atmosphere, oceans, land surface, polar ice regions and solid earth.

Program: Earth–Sun System Multi-Mission Operations
This program acquires, preserves, and delivers the observation data for the Science Mission Directorate/Earth–Sun System scientific focus areas in conformance with national science objectives.

Program: Earth–Sun System Division (ESSD)
The program observations and research aim to improve our capability for predicting weather, climate and natural hazards, including space weather. The focus of NASA's efforts in ESSD is the development and demonstration of space-based measurements, providing information about the Earth–Sun system not available by other means.

Program: Applied Sciences
The Applied Sciences program bridges the gap between scientific discoveries and practical applications that benefit society through partnerships that integrate the observations and predictions resulting from NASA Earth–Sun system science into solutions.

Program: Earth–Sun System Education and Outreach
The program uses NASA's results from studying the Earth system and the Sun to enhance the teaching and learning of Earth, space, and environmental sciences through partnerships with educational institutions and organizations.

Program: Earth–Sun Technology
NASA's ESSD is dedicated to understanding the total Earth–Sun system and the effects of natural and human-induced changes on the global environment.

BUSINESS LINE: EXPLORATION SYSTEMS

Theme: Constellation Systems
Through the Constellation Systems Theme NASA will develop, demonstrate, and deploy the collection of systems that will enable sustained human and robotic exploration of the Moon, Mars, and beyond.

Program: Earth Orbit Capability
The Earth Orbit Capability program is responsible for developing, demonstrating, and deploying the capability for crew transportation to Earth orbit.

Theme: Exploration Systems Research and Technology
The Exploration Systems Research and Technology (ESR&T) Theme represents NASA's commitment to investing in the technologies and capabilities that will make the national vision for space exploration possible.

Program: Advanced Space Technology
The Advanced Space Technology program develops new technologies that will enable NASA to conduct new human and robotic exploration missions, gather new types of scientific data, and reduce mission risk and cost.

Program: Technology Maturation
The Technology Maturation program develops and validates the most promising advanced space technology concepts and matures them to the level of demonstration and space flight validation, to enable safe, affordable, effective and sustainable human-robotic exploration.

Program: Robotic Lunar Exploration (RLE)
This program will undertake lunar exploration activities that enable sustained human and robotic exploration of the Moon. These activities will further science, and develop and test new approaches, technologies, and systems, including use of lunar and other space resources, to support sustained human space exploration.

Theme: Prometheus Nuclear Systems and Technology
Prometheus Nuclear Systems and Technology represents NASA's effort to develop an advanced technology capability for more complex operations and exploration of the solar system.

National Aeronautics and Space Administration
Required Supplementary Stewardship Information
(Fiscal Years 2006 and 2005 Are Unaudited)
Stewardship Investments: Research and Development (Continued)
For the Fiscal Year Ended September 30, 2006
(In Millions of Dollars)

Program: Advanced Systems and Technology
The Advanced Systems and Technology program develops and demonstrates advanced nuclear technologies and engineered systems. This technology development will be necessary to support NASA's goal of more distant, more ambitious, and longer duration human and robotic exploration of Mars and other destinations.

Program: Nuclear Flight Systems
The Nuclear Flight Systems program continues NASA's development of nuclear reactor power and associated spacecraft systems to enhance NASA's abilities to conduct robotic exploration and science operations.

Theme: Human Systems Research and Technology
This Theme focuses on ensuring the health, safety, and security of humans through the course of solar system exploration.

Program: Life Support and Habitation
The Life Support and Habitation program focuses on enabling human exploration beyond low Earth orbit by developing technologies to support human activity in and beyond low Earth orbit.

Program: Human Health and Performance
The Human Health and Performance program delivers research, technology, knowledge, and tools that will enable human space exploration. Specifically, the Human Health and Performance program will guide the development of various countermeasures to aid astronauts counteract any deleterious effects of long-duration missions in the space environment; develop tools and techniques to improve medical care delivery to space exploration crews; increase our biomedical knowledge and improve understanding of radiation effects to reduce the uncertainty in estimating space radiation health risks to human crews; and, acquire new information in exploration biology, which will identify and define the scope of problems that will face future human space explorers during long periods of exposure to space.

Program: Human Systems Integration
The Human-Systems Integration program conducts research and technology development driven by Agency needs for crew health; design of human spacecraft, space suits, and habitats; efficient crew operations; medical operations; and technology development to enable safe and productive human space exploration.

BUSINESS LINE: AERONAUTICS RESEARCH

Theme: Aeronautics Technology (AT)
Aeronautics Technology conducts high-quality, innovative research that will lead to revolutionary concepts, technologies, and capabilities that enable radical change to both the airspace system and the aircraft that fly within it.

Program: Aviation Safety
The Aviation Safety program builds upon the unique safety-related research capabilities of NASA to develop tools, methods, and technologies that will improve the intrinsic safety attributes of current and future aircraft, and to overcome aircraft safety technological barriers that would otherwise constrain the full realization of Next Generation Air Transportation System (NGATS).

Program: Airspace Systems
The Airspace Systems Program conducts cutting-edge air traffic management research that will enable the NGATS. In partnership with the Joint Planning and Development Office (JPDO), the ASP will help develop the concepts, capabilities and technologies that will lead to the significant enhancements in capacity, efficiency and flexibility needed to meet the Nation's airspace and airportal requirements for decades to come.

Program: Fundamental Aeronautics

The Fundamental Aeronautics program will conduct cutting-edge research that will enable the design of vehicles that fly through any atmosphere at any speed. Because aircraft of the future will need to address multiple and often conflicting design challenges such as noise, emissions, and performance, a key focus will be the development of physics-based, multidisciplinary design, analysis, and optimization (MDAO) tools. Such tools will make it possible to evaluate radically new vehicle designs and to assess, with known uncertainties, the potential impact of innovative concepts and technologies on a vehicle's overall performance.

NON-R&D Programs

BUSINESS LINE: SCIENCE

Theme: Earth–Sun System

Program: Education and Outreach

The program uses NASA's results from studying the Earth system and the Sun to enhance the teaching and learning of Earth, space, and environmental sciences through partnerships with educational institutions and organizations.

Program: SOFIA

Stratospheric Observatory for Infrared Astronomy (SOFIA) is a telescope mounted onto a specially designed Boeing 747. The project has considered the use of SOFIA as a platform for pursuits other than its primary mission of astronomy/astrophysics. According to SOFIA's Project Manager, a concept has been developed for SOFIA to be used for Earth Science investigations, simultaneously with SOFIA's prime mission. Also, additional in depth studies include using SOFIA as an experimental platform to test high bandwidth communications with Mars spacecraft or as a testbed for high-bandwidth earth communications.

BUSINESS LINE: SPACE OPERATIONS

Theme: Space Shuttle

The Space Shuttle is currently the only launch capability owned by the United States that enables human access to space, and the only vehicle that can support the assembly of the International Space Station (ISS). NASA will phase-out the Space Shuttle in 2010 when its role in ISS assembly is complete.

Theme: International Space Station

This Theme supports the construction and operations of a research facility in low Earth orbit as NASA's first step in achieving the Vision for Space Exploration. The ISS provides a unique, continuously operating capability to develop medical countermeasures for long-term human space travel: develop and test technologies and engineering solutions in support of exploration; and provide ongoing practical experience in living and working in space. It also supports a variety of pure and applied research for the U.S. and its International Partners. ISS assembly will be completed by the end of the decade. NASA is examining configurations for the Space Station that meet the needs of both the new space exploration vision and our international partners using as few Shuttle flights as possible. A key element of the ISS program is the crew and cargo services project, which will purchase services for cargo and crew transport using existing and emerging capabilities.

Theme: Space and Flight Support

This theme encompasses Space Communications, Launch Services, Rocket Propulsion Testing, and Crew Health and Safety. Space Communications consists of (1) the Tracking and Data Relay Satellite System (TDRSS), which supports activities such as the Space Shuttle, ISS, Expendable Launch Vehicles, and research aircraft, and (2) the NASA Integrated Services Network, which provides telecommunications services at facilities, such as flight support networks, mission control centers and science facilities, and administrative communications networks for NASA Centers. The Launch Services program focuses on meeting the Agency's launch and payload processing requirements by assuring safe and cost-effective access to space via the Space Shuttle and expendable launch vehicles.

National Aeronautics and Space Administration
Required Supplementary Information
(Fiscal Years 2006 and 2005 Are Unaudited)
Combined Schedule of Budgetary Resources
For the Fiscal Year Ended September 30, 2006
(In Millions of Dollars)

	Exploration, Science, and Aeronautics	Exploration Capabilities	Office of Inspector General	Other	Total
Budgetary Resources					
Unobligated Balance, Brought Forward, October 1	1,245	840	4	152	2,241
Recoveries of Prior Year Obligations	183	105	—	80	368
Budget Authority:					
Appropriation	9,761	7,048	32	2	16,843
Spending Authority from Offsetting Collections					
Earned					
Collected	598	360	—	31	989
Change in Receivable from Federal Sources	11	35	—	(5)	41
Change in Unfilled Orders					
Advance Received	36	8	—	13	57
Without Advance from Federal Sources	(129)	(81)	—	2	(208)
Subtotal	10,277	7,370	32	43	17,722
Nonexpenditure Transfers, Net:					
Actual Transfers, Budget Authority	85	(59)	—	—	26
Permanently Not Available					
Cancellations of Expired and No-year Accounts	—	—	—	(37)	(37)
Enacted Reductions	(125)	(85)	—	—	(210)
Total Budgetary Resources	**$ 11,665**	**$ 8,171**	**$ 36**	**$ 238**	**$ 20,110**
Status of Budgetary Resources					
Obligations Incurred:					
Direct:	9,630	7,047	32	59	16,768
Reimbursable:	578	384	—	43	1,005
Total Obligations Incurred	10,208	7,431	32	102	17,773
Unobligated Balance:					
Apportioned	1,403	707	—	33	2,143
Exempt from Apportionment	—	—	—	4	4
Total Unobligated Balances	1,403	707	—	37	2,147
Unobligated Balance Not Available	54	33	4	99	190
Total Status of Budgetary Resources	**$ 11,665**	**$ 8,171**	**$ 36**	**$ 238**	**$ 20,110**

National Aeronautics and Space Administration
Required Supplementary Information
(Fiscal Years 2006 and 2005 Are Unaudited)
Combined Schedule of Budgetary Resources
For the Fiscal Year Ended September 30, 2006 (Continued)
(In Millions of Dollars)

	Exploration, Science, and Aeronautics	Exploration Capabilities	Office of Inspector General	Other	Total
Change in Obligated Balance					
Obligated Balances, Net, October 1	3,454	1,950	6	563	5,973
Obligations Incurred, Net	10,209	7,431	32	101	17,773
Less: Gross Outlays	8,486	7,484	33	256	16,259
Less: Recoveries of Prior Year Unpaid Obligations	183	105	—	80	368
Change in Uncollected Customer Payments from Federal Sources	118	46	—	3	167
Obligated Balance, Net, End of Period					
Unpaid Obligations	5,343	1,984	5	339	7,671
Less: Uncollected Customer Payments from Federal Sources	231	146	—	8	385
Total, Unpaid Obligated Balance, Net, End of Period	**$ 5,112**	**$ 1,838**	**$ 5**	**$ 331**	**$ 7,286**
Outlays					
Net Outlays					
Gross Outlays	8,486	7,484	33	256	16,259
Less: Offsetting Collections	633	367	—	45	1,045
Subtotal	7,853	7,117	33	211	15,214
Less: Distributed Offsetting Receipts	—	—	—	8	8
Net Outlays	**$ 7,853**	**$ 7,117**	**$ 33**	**$ 203**	**$ 15,206**

National Aeronautics and Space Administration
Required Supplementary Information
(Fiscal Years 2006 and 2005 Are Unaudited)
Combined Schedule of Budgetary Resources
For the Fiscal Year Ended September 30, 2005
(In Millions of Dollars)

	Exploration, Science, and Aeronautics	Exploration Capabilities	Office of Inspector General	Other	Total
Budgetary Resources					
Unobligated Balance, Brought Forward, October 1	1,203	560	—	1,338	3,101
Recoveries of Prior Year Obligations	—	—	—	10	10
Budget Authority:					
Appropriation	7,743	8,552	32	(12)	16,315
Spending Authority from Offsetting Collections					
Earned					
Collected	476	338	—	37	851
Change in Receivable from Federal Sources	25	8	—	(12)	21
Change in Unfilled Orders					
Advance Received	—	15	—	(5)	10
Without Advance from Federal Sources	26	107	—	(16)	117
Subtotal	8,270	9,020	32	(8)	17,314
Nonexpenditure Transfers, Net:					
Actual Transfers, Budget Authority	197	(197)	—	—	—
Permanently Not Available					
Cancellations of Expired and No-year Accounts	—	—	—	(60)	(60)
Enacted Reductions	(62)	(67)	—	—	(129)
Total Budgetary Resources	**$ 9,608**	**$ 9,316**	**$ 32**	**$ 1,280**	**$ 20,236**
Status of Budgetary Resources					
Obligations Incurred:					
Direct:	7,817	8,088	29	1,045	16,979
Reimbursable:	546	388	—	85	1,019
Total Obligations Incurred	8,363	8,476	29	1,130	17,998
Unobligated Balance:					
Apportioned	1,270	771	2	30	2,073
Exempt from Apportionment	—	—	—	4	4
Total Unobligated Balances	1,270	771	2	34	2,077
Unobligated Balance Not Available	(25)	69	1	116	161
Total Status of Budgetary Resources	**$ 9,608**	**$ 9,316**	**$ 32**	**$ 1,280**	**$ 20,236**

National Aeronautics and Space Administration
Required Supplementary Information
(Fiscal Years 2006 and 2005 Are Unaudited)
Combined Schedule of Budgetary Resources
For the Fiscal Year Ended September 30, 2005, Continued
(In Millions of Dollars)

	Exploration, Science, and Aeronautics	Exploration Capabilities	Office of Inspector General	Other	Total
Change in Obligated Balance					
Obligated Balances, Net, October 1	2,567	1,687	4	301	4,559
Obligations Incurred, Net	8,363	8,476	29	1,130	17,998
Less: Gross Outlays	7,433	8,095	28	916	16,472
Less: Recoveries of Prior Year Unpaid Obligations	—	—	—	10	10
Change in Uncollected Customer Payments from Federal Sources	(51)	(115)	—	28	(138)
Obligated Balance, Net, End of Period					
Unpaid Obligations	3,795	2,145	5	543	6,488
Less: Uncollected Customer Payments from Federal Sources	349	192	—	10	551
Total, Unpaid Obligated Balance, Net, End of Period	**$ 3,446**	**$ 1,953**	**$ 5**	**$ 533**	**$ 5,937**
Outlays					
Net Outlays:					
Gross Outlays	7,433	8,095	28	916	16,472
Less: Offsetting Collections	476	352	—	33	861
Subtotal	6,957	7,743	28	883	15,611
Less: Distributed Offsetting Receipts	—	—	—	—	—
Net Outlays	**$ 6,957**	**$ 7,743**	**$ 28**	**$ 883**	**$ 15,611**

National Aeronautics and Space Administration
Required Supplementary Information
(Fiscal Years 2006 and 2005 Are Unaudited)
Deferred Maintenance
For the Fiscal Year Ended September 30, 2006

NASA has deferred maintenance only on its facilities, including structures. There is no significant deferred maintenance on other physical property, such as land, equipment, theme assets, leasehold improvements, or assets under capital lease. Contractor-held property is subject to the same considerations.

NASA developed a Deferred Maintenance parametric estimating method (DM method) in order to conduct a consistent condition assessment of its facilities. This method was developed to measure NASA's current real property asset condition and to document real property deterioration. The DM method produces both a parametric cost estimate of deferred maintenance, and a Facility Condition Index. Both measures are indicators of the overall condition of NASA's facility assets. The DM method is designed for application to a large population of facilities; results are not necessarily applicable for individual facilities or small populations of facilities. Under this methodology, NASA defines acceptable operating conditions in accordance with standards comparable to those used in private industry, including the aerospace industry.

While there have been no significant changes in our deferred maintenance parametric estimating method this year, the analysis of the changes in FCI data between FY05 and FY06 for these assets indicates that across assessment teams, the FCI is consistent and compatible with previous years' DM assessments. Most notably, a slight downward trend in overall FCI is evident, as would be expected due to system degradation over time, while a majority of assets showed no change in FCI. Finally, the majority of the assets whose FCI changed more than three standard deviations can be explained by deterioration and system adjustments-both of which are reasonable explanations for large variations in individual FCI ratings from year to year.

Deferred maintenance related to heritage assets is included in the deferred maintenance for general facilities. Maintenance is not deferred on active assets that require immediate repair to restore them to safe working condition and have an Office of Safety and Mission Assurance Risk Assessment Classification Code 1 (see NASA STD 8719.7).

	2006	Restated 2005
Deferred Maintenance Method		
Facility Condition Index (FCI)	3.6	3.7
Target Facility Condition Index	4.3	4.3
Backing of Maintenance/Repair Est. (Active and Inactive Facilities)	$2.05 B	$1.85 B

Office of Inspector General Letter on Audit of NASA's Financial Statements

National Aeronautics and
Space Administration

Office of Inspector General
Washington, DC 20546-0001

NOV 9 2006

TO: Administrator
Chief Financial Officer

FROM: Inspector General

SUBJECT: Audit of the National Aeronautics and Space Administration's Fiscal Year 2006 Financial Statements (Report No. IG-07-004)

Under the Chief Financial Officers Act of 1990, NASA's financial statements are to be audited in accordance with generally accepted government auditing standards. The Office of Inspector General selected the independent certified public accounting firm Ernst & Young LLP (E&Y) to audit NASA's financial statements in accordance with *Government Auditing Standards* and Office of Management and Budget's Bulletin No. 06-03, *Audit Requirements for Federal Financial Statements*.

In the *Report of Independent Auditors* (Enclosure 1), E&Y disclaimed an opinion on NASA's financial statements for the fiscal years ended September 30, 2006 and 2005. The disclaimer resulted from NASA's inability to provide E&Y auditable financial statements and sufficient evidence to support the financial statements throughout the fiscal year and at year-end.

The E&Y *Report on Internal Control* (Enclosure 2) includes two reportable conditions, which are considered to be material weaknesses. Material weaknesses were found in NASA's controls for (1) financial systems, analyses, and oversight used to prepare the financial statements, and (2) assuring that property, plant, and equipment and materials are presented fairly in the financial statements.

The E&Y *Report on Compliance with Laws and Regulations* (Enclosure 3) identifies several instances in which NASA's financial management systems did not substantially comply with the requirements of the Federal Financial Management Improvement Act of 1996 (FFMIA). For example, the report notes that certain subsidiary systems, including property, are not integrated with the Core Financial module and are not complemented by sufficient manual preventative and detect type controls. The report also identifies instances of noncompliance with certain provisions of the Antideficiency Act and with the Improper Payments Information Act of 2002.

NASA made significant progress in correcting two of the four deficiencies noted in FY 2005; specifically, Fund Balance with Treasury (FBWT) and estimating environmental liabilities. However, NASA's continued problems in resolving its other internal control weaknesses have contributed to its inability to produce complete and

accurate financial statements. NASA's two remaining internal control deficiencies are material weaknesses that have been reported for several years.

NASA prepared a corrective action plan in FY 2006 to address the material weaknesses and recommendations noted in the FY 2005 financial statement audit report. NASA should address the findings detailed in the enclosed reports and NASA's internally identified material weaknesses noted in the Administrator's Statement of Assurance in a new updated, corrective action plan. That plan must be detailed enough to ensure successful implementation with desired results. In addition, NASA must continue to

- ensure that the Office of the Chief Financial Officer is staffed with properly trained personnel who can address the Agency's financial management and accountability challenges;
- ensure that accounting practices are consistent with applicable standards and are consistently applied;
- establish internal controls that provide reasonable assurance that the financial statements are supported, complete, and accurate; and
- implement recommendations made in E&Y's *Report on Internal Control*, as well as those made by our office and the Government Accountability Office.

E&Y is responsible for each of the enclosed reports and the conclusions expressed therein. Accordingly, we do not express an opinion on NASA's financial statements, internal controls over financial reporting, or compliance with certain laws and regulations, including, but not limited to, FFMIA.

In fulfilling our responsibilities under the Chief Financial Officers Act of 1990, we provided oversight and technical support. We monitored the progress of E&Y's audit, reviewed reports submitted by E&Y, and ensured that E&Y met contractual requirements.

Robert W. Cobb

Robert W. Cobb

3 Enclosures

Report of the Independent Auditors

Report of Independent Auditors

To the Administrator and the Office of Inspector General
of the National Aeronautics and Space Administration

We were engaged to audit the accompanying consolidated balance sheets of the National Aeronautics and Space Administration (NASA) as of September 30, 2006 and 2005, and the related consolidated statements of net cost, changes in net position and financing and combined statements of budgetary resources for the fiscal years then ended. These financial statements are the responsibility of NASA's management.

During fiscal year (FY) 2003, NASA implemented an Integrated Financial Management Program (IFMP) system (now referred to as the Integrated Enterprise Management Program [IEMP] system), specifically the Core Financial Module. NASA's management identified significant errors beginning with its September 30, 2003 financial statements resulting from the implementation of IEMP. During FY 2004 through FY 2006, NASA's management continued to identify and resolve significant system conversion and data integrity issues, implement internal control, and develop policies and procedures. In FY 2005 and FY 2006, internal control and financial reporting processes using the Core Financial Module were continuing to evolve, including the implementation and refinement of routine account analysis and reconciliation processes and the analysis of alternatives in developing effective approaches in accounting for property, plant, and equipment. As a result of these limitations, we were unable to obtain sufficient evidential support for the amounts presented in the consolidated balance sheets as of September 30, 2006 and 2005, and the related consolidated statements of net costs, changes in net position and financing and combined statements of budgetary resources for the fiscal years then ended.

Because of the matters discussed in the preceding paragraph, the scope of our work was not sufficient to enable us to express, and we do not express, an opinion on the consolidated balance sheets as of September 30, 2006 and 2005, and the related consolidated statements of net cost, statements of changes in net position and financing, and combined statements of budgetary resources for the fiscal years then ended.

In its preparation and analysis of its September 30, 2006 and 2005 financial statements, NASA identified but largely did not quantify certain configuration and data integrity issues and errors in balances reported on its financial statements. The notes to the financial statements describe certain departures from accounting principles generally accepted in the United States of America in NASA's FY 2006 and FY 2005 financial statements. The notes also refer to a potential adjustment for certain mission-related assets (theme assets) that, if recorded, could have a significant impact on the financial statements.

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The information presented in the Management's Discussion and Analysis (MD&A), the Required Supplementary Stewardship Information, and the Required Supplementary Information is not a required part of the NASA's financial statements but is considered supplementary information required by Office of Management and Budget (OMB) Circular A-136, *Financial Reporting Requirements*. Such information has not been subjected to auditing procedures, and accordingly, we express no opinion on it. We were unable to apply to the information certain procedures prescribed by professional standards within the time frames established by OMB because of the limitations on the scope of our audit of the financial statements discussed above. Finally, programs identified in the FY 2005 financial statements do not directly align with the major goals and outputs described in the MD&A.

In accordance with *Government Auditing Standards*, we have also issued our reports dated November 3, 2006 on our consideration of NASA's internal control over financial reporting and on our tests of its compliance with certain provisions of laws, regulations, and other matters. The purpose of those reports is to describe the scope of our testing of internal control over financial reporting and compliance and the results of that testing and not to provide an opinion on the internal control over financial reporting or on compliance. Those reports are an integral part of an audit performed in accordance with *Government Auditing Standards* and should be considered in assessing the results of our work.

Ernst + Young LLP

November 3, 2006
Washington, D.C.

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Report on Internal Control

To the Administrator and the Office of Inspector General
of the National Aeronautics and Space Administration

We were engaged to audit the financial statements of the National Aeronautics and Space Administration (NASA) as of and for the year ended September 30, 2006, and have issued our report thereon dated November 3, 2006. The report states that because of the matters discussed therein, the scope of our work was not sufficient to enable us to express, and we do not express, an opinion on the consolidated balance sheet as of September 30, 2006, and the related consolidated statements of net cost, changes in net position and financing and combined statement of budgetary resources for the fiscal year then ended.

In planning and performing our work, we considered NASA's internal control over financial reporting in order to determine our procedures for the purpose of expressing an opinion on the financial statements, which we were ultimately not able to do, and not to provide an opinion on the internal control over financial reporting. We limited our internal control testing to those controls necessary to achieve the objectives described in Office of Management and Budget (OMB) Bulletin No. 06-03, *Audit Requirements for Federal Financial Statements*. We did not test all internal controls relevant to operating objectives as broadly defined by the Federal Managers' Financial Integrity Act of 1982 (FMFIA), such as those controls relevant to ensuring efficient operations. However, we noted certain matters involving the internal control over financial reporting and its operation that we consider to be reportable conditions. Reportable conditions involve matters coming to our attention relating to significant deficiencies in the design or operation of the internal control over financial reporting that, in our judgment, could adversely affect NASA's ability to initiate, record, process, and report financial data consistent with the assertions of management in the financial statements. The reportable conditions we noted are described below.

A material weakness is a reportable condition in which the design or operation of one or more of the internal control components does not reduce to a relatively low level the risk that misstatements caused by error or fraud in amounts that would be material in relation to the financial statements being audited may occur and not be detected within a timely period by employees in the normal course of performing their assigned functions. Our consideration of the internal control over financial reporting would not necessarily disclose all matters in the internal control that might be reportable conditions and, accordingly, would not necessarily disclose all reportable conditions that are also considered to be material weaknesses. However, of the reportable conditions described below, we consider both matters noted—Financial Systems, Analyses, and Oversight; and Enhancements Needed for Controls over Property, Plant, and Equipment and Materials—to be material weaknesses.

MATERIAL WEAKNESSES

Financial Systems, Analyses, and Oversight (Modified Repeat Condition)

Overview

In fiscal year (FY) 2002, NASA initiated a seven-year agency-wide effort to provide a single integrated suite of financial, project, contract, and human capital tools to help manage NASA's programs and prepare financial information on a timely basis consistent with evolving OMB guidance. During FY 2003, NASA implemented an Integrated Financial Management Program (IFMP) system (now referred to as the Integrated Enterprise Management Program [IEMP] system), specifically the Core Financial Module. The Core Financial Module replaced ten disparate center-level accounting systems and the NASA Headquarters accounting system, along with approximately 120 ancillary subsystems in operation for the past two decades. This conversion effort necessitated complex, extensive data cleanup, which was not always successfully completed.

Beginning with its September 30, 2003 financial statements NASA's management identified significant errors resulting from the implementation of the IEMP system. From FY 2004 through FY 2006, NASA's management continued to identify and resolve significant system conversion and data integrity issues, implement internal control, and develop policies and procedures. We observed progress in financial management processes in FY 2006, including

- Center Periodic Monitoring Package Submissions—During August 2005, NASA issued a policy requiring each center to perform a monthly process of standardized reviews and reconciliations of financial data to identify anomalies and out of balance scenarios to provide a NASA-wide structure for reconciliation and analysis of financial data. By the 25th business day after month-end, the center's Office of the Chief Financial Officer (OCFO) is required to review and certify to the completeness of the package and forward the results to the Headquarters OCFO for further review. All supporting documentation is maintained at each center.

- Fund Balance with Treasury—NASA continued to make progress in resolving its fund balance with Treasury imbalance. Corrective actions continued into the summer of FY 2006 clearing prior reconciling items and resolving current unreconciled balances.

- Implementation of OMB A-123 Process—NASA contracted with an independent accounting firm to assist NASA in its implementation of requirements identified in OMB A-123, *Management's Responsibility for Internal Control* which requires each federal agency to establish, assess, correct, and report on internal control to improve the accountability and effectiveness of Federal programs and operations.

- Improvement in Processes related to Environmental Liabilities—During FY 2006, NASA implemented updated policies, improved processes, and provided training to the Headquarters and Center technical and financial personnel who prepare the environmental liability estimates.

- Subsidiary Listing of Transactions to Support the General Ledger—Through a coordinated effort between the Competency Center and the Headquarters OCFO, a subsidiary listing of transactions for various real and nominal accounts was provided to support and analyze its general ledger.

- Theme Assets—During August 2006, NASA management met with the Accounting and Auditing Policy Committee (AAPC) of the Federal Accounting Standards Advisory Board (FASAB) to obtain guidance as to whether theme assets, totaling approximately $12 billion, should be capitalized or expensed as research and development costs. However, a formal decision will not be issued until after November 15, 2006.

- Financial Management System Certification and Accreditation—During FY 2006, NASA had its core financial system certified and accredited.

- Guidance and Training—The Headquarters OCFO has issued updated Financial Management Requirements (FMR) for the remaining five out of 19 chapters and provided additional training to Center and Headquarters personnel.

- Contractor Reported Excess Costs Over Obligations—During FY 2006, as part of its periodic monitoring and year-end closing processes, NASA developed alternative procedures that are expected by management to ensure that excess contractor reported costs and the corresponding obligations would be researched, recorded, and resolved in a timely fashion to ensure appropriate recording of accrued costs and related obligations to its general ledger.

However, significant financial management issues continue to impair NASA's ability to accumulate, analyze, and distribute reliable financial information. Our testing of internal control continued to disclose certain weaknesses, including lack of integrated financial management systems, incomplete efforts to resolve data integrity issues, and weaknesses in entity-wide internal control which impaired NASA's ability to report accurate financial information on a timely basis. In many cases the progress noted above and related processes continued to be developed in FY 2006 and will require additional refinements in FY 2007.

Routine Reconciliation, Analyses and Oversight Processes

The U.S. Government Accountability Office's (GAO) *Standards for Internal Control in the Federal Government* states that internal control activities help ensure that management's directives are carried out. The control activities should be effective and efficient in

accomplishing the organization's control objectives. Examples of control activities include top-level reviews, reviews by management at the functional or activity level, segregation of duties, proper execution of transactions and events, accurate and timely recording of transactions and events, and appropriate documentation of transactions and internal control. During FY 2005, we found that certain processes were not adequately performed to ensure differences were properly identified, researched, and resolved in a timely manner and that account balances were complete and accurate. Although we noted progress during FY 2006, continued emphasis on internal control processes is needed to provide NASA the ability to report accurate financial information in a timely fashion.

Periodic Monitoring Package Submission

At the end of FY 2005, NASA management developed an entity-wide structure for routine reconciliation, analyses, and oversight processes. Throughout FY 2006 and on-going into FY 2007, NASA management continues to identify enhancements to the process. The periodic monitoring package, a monthly process performed at the centers and forwarded to headquarters, is designed to identify issues impacting the integrity of the centers' financial management information and provide a means for communication and tracking of the issues centrally within the Headquarters OCFO. The process includes 23 separate analyses of significant financial processes within the center including, for example, fund balance with Treasury, accounts receivable and payable, budgetary, and contractor reporting. Each analysis is required to include a coversheet depicting the preparer's and reviewer's sign off, whether exceptions exist, and what the exceptions are. The coversheet submissions are due to the Headquarters' OCFO by the 25th business day after the end of each month and require a certification from the center Chief Financial Officer (CFO) indicating their review. Our review of these submissions and the related support maintained at the center identified progress at the centers in identifying issues, including system configuration concerns, continuing data integrity issues—dating back prior to the system conversion in 2003, and other issues requiring immediate attention by NASA management. However, our review of these packages also identified certain weaknesses in processes that could impair NASA's ability to correct material errors in a timely fashion. Specific concerns are as follows:

- Our review of the centers' submissions and the supporting documentation maintained at the centers identified inconsistencies in the procedures performed, the reports utilized, and the results provided among the various centers. Our review of NASA's FMR identified general guidelines as to the reconciliation to be performed, but is not specific as to the reports to be used or the specific procedures to be performed. Per discussions with Headquarters OCFO, additional training, site visits by the Headquarters submission reviewers, and improved guidance are expected during FY 2007.

- During our review of the coversheets and the related supporting documentation, we noted that although the coversheet would indicate no exceptions, the supporting documentation would identify exceptions that were not reported to Headquarters. Additionally, we noted that certain centers did not disclose certain discrepancies because they deemed them as

agency-level issues and were out of the control of the center. Per center management, formal guidance is needed to explain what is to be identified as an exception on the coversheet.

- We noted certain issues within the centers' submissions that had been identified for several months but had not been resolved in a timely fashion. Per discussions with center management, in most cases, the issues had been forwarded to headquarters either with a service request or the need for headquarters guidance but the center was awaiting guidance. Certain centers indicated that some of the delays occur due to not knowing who to contact at headquarters—primarily due to turnover in headquarters positions. Per discussions with headquarters personnel, as of October 2, 2006, there was a backlog of more than 78 service requests. Headquarters personnel indicated that procedures are still evolving and as a result certain items are still being worked. During FY 2007, headquarters OCFO personnel indicated that they are implementing procedures to resolve many of these items. Currently, other than such service requests, issues identified by the centers are not centrally tracked to determine the extent of the issue.

Fund Balance with Treasury

Treasury regulations require that each federal entity ensure that it reconciles, on a monthly basis, its financial records with Treasury's records and that it promptly resolves differences. If this reconciliation is not adequately performed, loss, fraud, and irregularities could occur and not be promptly detected, and/or financial reports that are inaccurate may be prepared and used in decision-making.

Throughout FY 2003, NASA implemented, in phases, a commercial off-the-shelf, agency-wide, integrated financial management system that replaced ten separate accounting systems in operation at NASA centers. This effort, which involved converting accounting data in the "legacy" accounting systems to a new accounting system, created complex accounting issues for FY 2003. Consequently, as noted in the FY 2003 audit report, as well as in our subsequent audit reports, NASA posted year-end adjustments outside its Core Financial Module, which indicated that the difference between its fund balance with Treasury balance and Treasury's balance was significantly greater than had been presented in its year-end reconciliation. In addition, these adjustments did not provide sufficient documentary evidence to explain the linkage between the adjustments and the unreconciled differences identified on headquarters' fund balance with Treasury reconciliations as of September 30, 2003.

Between FY 2003 and the third quarter of FY 2006, NASA management expended significant effort analyzing its differences related to the conversion and refining its procedures to ensure reconciliations for current activity going forward were performed properly to resolve reconciling differences in a timely fashion. On a monthly basis, these differences are now required to be reported to Headquarters' Office of the Chief Financial Officer via the periodic monitoring submission to ensure appropriate resolution. During June 2006, Headquarters' OCFO in

conjunction with the centers made the decision to write-off residual pre-conversion differences of $22 million.

Our review of current year reconciliations identified progress in the preparation and more timely identification and resolution of differences arising from current period transactions. As of June 30, 2006, budget clearing, suspense, and unreconciled differences totaled an absolute value of $92.6 million. However, although progress was noted, we continued to identify old outstanding items greater than six months old. Additionally, one of NASA headquarters' reconciliation steps to understanding these differences includes identifying differences between amounts in the Central Resources Control System (CRCS) and the Core Financial Module. CRCS is the database used by OCFO for budget control by establishing resource plans for all levels. Each month, Resources Authority Warrants (NF 506) are issued from headquarters to centers and monthly activities are posted to CRCS. NASA personnel indicated differences between CRCS and the Core Financial Module occur because of timing differences on entering funding data and fund allocations in CRCS and the Core Financial Module between headquarters and the centers.

In preparation for the financial management system upgrade—expected to occur in October of FY 2007—NASA management took additional efforts to clear out their suspense, budget clearing, and unreconciled differences during the fourth quarter of FY 2006. At September 30, 2006, we were informed that an absolute value of differences for NASA in such accounts was $10.7 million.

Budgetary Analyses

Within the federal government, the budget is a primary financial planning and control tool. OMB Circular A-11, *Preparation, Submission and Execution of the Budget,* implements the requirements of budget formulation and execution including requirements related to apportionments, accounting systems to control spending, proper recording of obligations, and closing accounts. For internal control purposes, budgetary monitoring is a key management control that, if implemented correctly, identifies cost overruns and potential material misstatements in a timely fashion.

Although we determined that reviews of the budget were being performed at the center and mission directorate level, our review of the budgetary status of funds report identified some negative balances whereby costs appeared to exceed obligations. Additionally, we noted that the centers used different reports to assess funds availability as compared to headquarters. Many of the centers indicated that the negative balances were awaiting correction or the balances in the report could not be relied upon because the amount was based on estimates. The cost over obligations edits (discussed later under "Efforts Needed to Resolve Data Integrity Concerns"), disaggregated estimation process used for certain contract accruals, and CRCS to core financial module process noted above can greatly complicate the review of status of funds reports, and could desensitize reviewers to problems normally inherent in anomalous balances.

In the past few years, NASA has had more than one possible anti-deficiency act violation. The Office of Inspector General reported there were anti-deficiency violations and management agreed to report as required. To ensure these violations do not continue, enhanced budgetary monitoring processes are required.

Financial Statement Preparation Processes

Our review of NASA's financial statement preparation process identified certain issues impacting NASA's ability to effectively accumulate, assemble, and analyze information to timely develop its financial statements on a routine and recurring basis. Currently, although processes continue to be improved, data integrity issues, systems that are not fully integrated and evolving account reconciliation and periodic analysis processes continue to provide challenges in the development of auditable financial statements. The following represent issues identified during the financial statement preparation process:

- The requirement that each agency submit its Performance and Accountability Report (PAR) by approximately November 15 has created challenges for all agencies. The completed PAR for NASA was not available until the last week of October which did not provide sufficient time to meet deadlines for completion of the audit, review and submission processes. Many agencies have accelerated their PAR process by providing performance and other information as of an earlier date, and holding only very limited sections open for updates of information. Further, for both interim and year-end financial statements, certain analyses were not performed by OCFO until after the financial statements were submitted for audit purposes, suggesting that review processes may not be fully effective. Finally, although we were informed and documentation indicated that the PAR and supporting analyses had been through a rigorous review process prior to our audit, we noted that mistakes and errors were missed by the review process and that much of the preparation and many reviews were performed with contractor assistance. NASA personnel had limited capability to describe how balances reflected in the statements were derived, one aspect of an effective supervision and review process.

- Although NASA had indicated that it performed and upper management had reviewed its quarterly fluctuation analyses of its financial information to identify unusual balances, our review of NASA's analysis of its September 30, 2006 financial statements identified inconsistencies for which we required further explanation. Upon further inquiry, NASA indicated that due to previous data integrity issues, the balances they were comparing created variances that could not be explained. Management expected a better analysis would be available in FY 2007.

- For the third quarter financial statements, NASA had not reconciled all of its intra-governmental balances with its trading partners. Our review of the Treasury difference report identified over $200 million for which NASA could not identify the reasons for differences with its trading partners. Further, we determined that intra-NASA transactions had not been eliminated from the initial draft of the financial statements.

Many of these transactions related to services provided to the centers from the new shared service center.

- For both interim and year-end financial statements, we noted that financial statements submitted to OMB and for audit purposes were not compliant with OMB Circular A-136, *Financial Reporting Requirements*. We noted that certain disclosures, including those for net costs, undelivered orders, and intra-governmental balances had not been updated to ensure consistency with new guidance. Checklists and other tools (an annotated copy of A-136) which can help ensure that reports are appropriately prepared were not used effectively to identify the requirements of OMB Circular A-136 to ensure compliance.

- We noted that adequate documentation to support certain transactions was not readily available. Our testing of transactions identified several items where we did not receive sufficient information to determine if the transaction was valid. For example, NASA could not provide documentation to support its assertion that certain accruals were not necessary to be recorded in its financial statements as of September 30, 2006. According to OCFO management, NASA implemented processes intended to minimize the extent of required accruals, and did not record such accruals. We were unable to assess the effectiveness of this process, and whether grantees and contractors accelerated all billings for services rendered through September 30th by September 27th as the systems were not operating during conversion to the new financial management system. To the extent such processes are not consistent with Federal Acquisition Regulations (FAR) or cost principles associated with execution of grants, it is possible that grantees and contractors would not have advance billed NASA for services that they would normally not draw down funds for or invoice for until late October or November. Depending on the results seen by NASA in the beginning of FY 2007 through a review of subsequent disbursements, it may be possible to modify this approach to incorporate and estimate for any remaining necessary accrual.

Efforts Needed to Resolve Data Integrity Concerns

NASA's management continues to identify data integrity issues in the Core Financial Module that impairs its ability to prepare accurate and complete financial statements. Data integrity issues identified during FY 2003 and prior continue to impair FY 2006 account balances. Although much progress was seen during FY 2006, our testing continues to identify similar issues. Additionally, although the centers were able to provide subsidiary listings; the listings are frequently being generated from non-routine processes, not directly from the financial management module. Specific concerns noted include the following:

- During FY 2005, we reported that NASA designed its new Core Financial Module to include a system edit whereby, if costs (and the corresponding liabilities) are greater than the associated obligations, the difference would not be recorded in NASA's general ledger but rather maintained outside of the general ledger system. Instead, the differences were adjusted at the contract/project level by posting a liability to match the

excess costs. Statement of Federal Financial Accounting Standards (SFFAS) No. 1, *Accounting for Selected Assets and Liabilities*, SFFAS No. 4, *Managerial Cost Accounting Concepts & Standards*, and NASA's FMRs require costs to be accrued in the period in which they are incurred and any corresponding liability to be recorded as an account payable. During FY 2006, as part of its periodic monitoring and year-end closing processes, NASA developed alternative procedures that are expected by management to ensure that excess contractor reported costs and the corresponding obligations would be researched, recorded, and resolved in a timely fashion.

As part of its periodic monitoring process, management indicated that the center OCFO is expected to work closely with the appropriate procurement official, the project manager, and the vendor to initiate the necessary contract funding modification actions to record timely increases to obligations, record excess costs, resolve mistakes in vendor reporting, obtain explanations for cost adjustments, and to validate the processes the vendor will have in place to prevent over costing in the future. Once the modification is identified, the center OCFO personnel should record the appropriate transactions to ensure amounts have been reported in the general ledger system. If amounts are not corrected by quarter-end, the center should report the status through its monthly periodic monitoring process to Headquarters' OCFO for assistance.

At year-end, Headquarters' OCFO runs a report that identifies by fund center those "costs over obligation" amounts that have not been resolved nor recorded in the general ledger. Headquarters' OCFO indicated that they then net the balances for each fund center and process top-side entries to the general ledger to either accrue the costs or obligations or process the downward cost adjustment. These entries are expected to be reversed in the first quarter of the following fiscal year so that the centers can perform the appropriate research within the normal quarterly process. It is our understanding that certain accruals of costs and obligations may be against expired funds. Management believes this process is in accordance with federal budgetary requirements.

Due to the timing of the new processes being implemented, we were unable to determine the effectiveness of these processes during FY 2006 to record accruals for costs that were in excess of recorded obligations and related obligations and downward adjustments that were necessary to record such costs in the general ledger at year-end.

- We noted numerous grants and contracts which had periods of performance prior to FY 2006 which had not officially been closed due to limited resources available for follow-up of missing or incomplete documentation from the vendor/grantee and a significant backlog of large amounts awaiting de-obligation. For several years, NASA has utilized an outside contractor to resolve the large backlog. For grants, because of the delay of close-out within the grant system, allocation of current activity costs were being posted as current expense against the expired grant obligation. As of March 31, 2006, we noted over 4,000 grants and 3,000 contracts for FY 2005 and prior which were past their period of performance still awaiting closeout and de-obligation. Further, we noted several grant

and contract sample items where requested supporting documentation was not available or not part of the official file.

- Although the centers use financial management and ad-hoc reports for management oversight purposes, such as aging analyses and collection initiatives, we noted during our testing that numerous accounts receivable were related to balances that were greater than one year old. Many of the balances relate to current and former employees, vendor amounts, conversion issues, and balances with other government agencies. The number of employee related items and their myriad causes are of note and merit rigorous follow up. As of March 31, 2006, we noted over 16% of accounts receivable or approximately $28 million greater than one year old. Additionally, we noted inconsistencies among the centers as to the timing of when amounts are posted to the allowance for doubtful accounts.

- Although the periodic monitoring package includes a quarterly step to review unliquidated obligations and accounts payable to ensure balances that are recorded in NASA's financial system are valid and supportable, we noted that the centers do not currently age their undelivered orders or their accounts payable to identify old balances that may require follow-up or de-obligation. As of June 30, 2006, we noted numerous unliquidated obligations and accounts payable that were greater than one year old.

- We noted certain transactions were recorded utilizing budget object classes inconsistent with OMB Circular A-11 guidance. During our testing of grants and contracts, while we noted certain contracts recorded to the grant and subsidy object class, certain contracts were recorded to budget classes consistent with grants.

In some cases, individual items selected for audit testing were further researched and actions were taken by NASA management to follow-up on such items and appropriately resolve them. Similar efforts are needed for numerous other old items.

Processes in Estimating NASA's Environmental Liability Require Enhancement

During our review of NASA's unfunded environmental liability (UEL) totaling $893 million as of September 30, 2006 and related disclosures to the financial statements, we noted that NASA has made progress in resolving several weaknesses that impeded its ability to generate an auditable UEL estimate. Specifically, progress has been made in documenting the UEL process and training the Remedial Project Managers (RPMs) that prepare the estimates. However, NASA has not validated the Integrated Data Evaluation and Analysis Library (IDEAL) software program that it uses to estimate a portion of its UEL estimate. Additionally, while NASA has begun to integrate the OCFO into the UEL estimation process, additional integration is required. Finally, NASA should assess its reporting and disclosure against other similarly situated federal entities and commercial enterprises as an aid in ensuring that disclosures are meaningful.

IDEAL – The IDEAL software application is a parametric cost-estimating model that estimates the cost of environmental remediation liabilities based on average cost experiences for similar conditions. NASA uses these IDEAL algorithms to estimate approximately $190 million of its UEL. In addition, IDEAL aggregates and reports on all UEL estimates even if they were prepared externally to IDEAL. As previously identified in our prior reports, the IDEAL model has not undergone an independent software verification and validation. While the inputs to the IDEAL model can be verified, the output of the equations (e.g., the cost estimate) cannot be verified without performing a zero-cost re-estimation of the remediation scenario.

In addition, as the IDEAL data files are part of NASA's support for its UEL estimate, we reviewed the process and noted several other control weaknesses in the application.

- Data Security – The current version of IDEAL is a host/client application. NASA's users enter data into a desktop application that transmits the data to a third-party service contractor. This contractor then processes the data and returns it to NASA over the Internet. During our review we were notified that while the password authentication is secure, all other data transmissions are not.

- SAS 70[1] – NASA's third-party service contractor manages the host IDEAL application and processes the calculation of the UEL estimate. We noted that NASA has not evaluated the controls between itself and its service providers through either a SAS 70 or other mechanism, and did not do so as part of the OMB Circular A-123 process.

- User Defined Interface (UDI) – As noted in prior years, NASA's users have complete access to the parametric equations, cost tables, warning limits and other parameters in the model through the UDI. While a report has been developed that would highlight when the center/facility specific default parameters were modified, it would not identify if any of the global parameters/equations in any of the models were modified.

- Documentation – We noted weaknesses in the printed reports generated by IDEAL as they did not provide a complete record of the information contained in the IDEAL data files. NASA indicated that the electronic data files in IDEAL were the official record for the UEL estimates included in its financial statements. Because IDEAL is a host/client application, NASA does not maintain control over the host application, and therefore, updates and changes made to the host program will alter the processing of NASA's client data since it is recomputed every time it is processed without any archive or electronic audit trail. Electronic IDEAL data files archived by NASA as part of the FY 2006 audit

[1] A Statement of Auditing Standards No. 70, *Reports on the Processing of Transactions by Service Organizations* (SAS 70) report provides for a service organization's description of its controls that may be relevant to a client's internal control, on whether such controls had been placed in operation as of a specific date, on whether they are suitably designed to achieve specified control objectives, and on whether the controls that were tested were operating with sufficient effectiveness to provide reasonable, but not absolute, assurance that the related control objectives were achieved during the period specified.

might provide different results when processed by the IDEAL host application in the future.

During our online review of entries within electronic files, we noted that numerous warning and error messages were not addressed in the online documentation as to the cause or reconciliation. For example, IDEAL might provide the user with a warning or error that the limits in a parametric equation were being exceeded. While overriding these warnings might be acceptable, there was typically no documentation to support the override decision.

OCFO Involvement – During FY 2006 NASA made progress in implementing a quality review function that was independent of the centers/facilities that prepared the UEL estimate. It also began to integrate the OCFO into the training of the RPMs and the independent review function. In addition, during our review we noted improvement in the process that the centers/facilities used in preparation of the estimate. However, during our review we noted several accounting matters that might have been rectified earlier with additional center OCFO involvement. For example,

- Year-to-Year Changes - While NASA has begun tracking the technical reasons for changes in the year-to-year UEL estimates we noted weaknesses in tracking and analyzing changes in accordance with the accounting literature.

- Documentation – As part of the new quality review process, the center CFOs statistically sample and review IDEAL documentation. However, it was not always apparent what documentation the OCFO considered during their review. Because of software limitations, certain documentation was not attached in IDEAL as originally planned nor was a note included in IDEAL as to what was considered the official documentation. Finally, we noted discrepancies in the effective dates and versions of estimates in IDEAL.

Financial Management Systems Not in Substantial Compliance with FFMIA

The NASA financial management systems are not substantially compliant with the Federal Financial Management Improvement Act (FFMIA) of 1996. FFMIA requires agencies to implement and maintain financial management systems that comply with federal financial management systems requirements. More specifically, FFMIA requires federal agencies to have an integrated financial management system that provides effective and efficient interrelationships between software, hardware, personnel, procedures, controls, and data contained within the systems. The financial management system continues to impair NASA's and the centers' abilities to adequately support and analyze account balances reported.

Although NASA implemented a commercial off-the-shelf financial module approved by the former Joint Financial Management Improvement Program (JFMIP), certain aspects of the NASA accounting system lack integration and do not conform to the requirements. NASA's

management continues to identify configuration issues in the Core Financial Module that resulted in inappropriate transactional postings. Finally, certain subsidiary systems, including systems used to account for property, plant, and equipment, the largest NASA asset, are not integrated with the Core Financial Module. Specific weaknesses noted include the following:

- Certain subsidiary systems, including all property systems (i.e., NEMS, NRPDB, and CHATS), are not integrated with the Core Financial Module and are not complemented by sufficient manual preventative and detect type controls.

- NASA's management continued to identify certain transactions that are being posted incorrectly due to improper configuration or design within the Core Financial Module. For example, during our review of the centers' periodic monitoring packages, the centers identified abnormal balances within the general ledger. The centers indicated that they believed the differences were caused by the design of the system and that system requests had been forwarded to headquarters for consideration to resolve the various issues. Additionally, during our review of the reconciliation of the financial information (FI) module to the funds management (FM) module, both residing within the IEMP, we noted that discrepancies existed due to journal entries not being properly mapped to both modules when posted.

- Although the amount is not material, the second quarter balance sheet generated from the Core Financial Module did not balance, meaning that assets did not agree to liabilities plus net position. Adjustments were made outside the system to correct this prior to submission of the quarterly statements to OMB.

- The Core Financial Module was still unable to provide a breakdown of costs by the four mission directorates which NASA has identified as significant segments for FY 2005. This is not consistent with the requirements of SFFAS No. 4, which calls for presentation of costs by responsibility segment for each fiscal year presented.

- Due to systematic limitations, NASA centers continue to use alternative approaches to ensure data and financial management information is readily available to make critical decisions. These alternative approaches are inconsistent between centers and may cause varied results in the accuracy of reporting from the centers to headquarters. For example, during our center visits, we noted that some centers use manually created spreadsheets to track invoice due dates to ensure compliance with Prompt Payment Act requirements. However, we noted that other centers rely on IEMP to track the payment due dates for compliance.

We noted that NASA is in the process of implementing a software version update which OCFO believes will address some of the systems implementation issues related to the IEMP.

Weaknesses in Information Technology General and Application Controls

Several access and segregation of duties issues were noted within the IEMP environment. The level of risk associated with these information technology issues depends in part upon the extent to which financial-related compensating controls (such as reconciliations and data integrity reviews of output) are in place and operating effectively throughout the audit period. Certain controls designed to detect errors or inappropriate processing may also not be executed in a manner which can be expected to identify errors, which, while perhaps not material to the financial statements as a whole, may subject NASA to risks regarding safeguarding of assets. Within the context of the overall weaknesses identified in the control environment referenced in the accompanying comments and although NASA has made progress in addressing and resolving prior year information technology findings, these information technology-related issues along with issues noted by NASA OIG in various engagements and their ongoing review of the SAP Version Update (SVU) project merit continued management focus.

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Due to the severity of these issues, an integrated financial system, a sufficient number of properly trained personnel, well-documented policies and procedures, stronger leadership from the Headquarters' Office of the Chief Financial Officer, and a strong oversight function are needed to ensure that periodic analyses and reconciliations are completed to detect and resolve errors and irregularities in a timely manner.

Recommendation

We recommend that NASA continue to develop and refine its financial management systems and processes to improve its accounting, analysis, and oversight of financial management activity. Specifically, we recommend that NASA:

- Continue to strengthen controls related to its entity-wide structure for account reconciliation, analyses and oversight by building consistency among centers, providing more in-depth guidance and training for financial personnel, strengthen headquarters oversight by visiting the centers, periodically requesting the supporting documentation to compare to the coversheets, and to improve communication so that issues may be resolved in a more timely manner.

- Continue to improve its current Fund Balance with Treasury procedures to ensure that all reconciling items are thoroughly researched, properly documented, timely resolved, and reviewed by appropriate center and headquarters OCFO personnel.

- Continue to build on budgetary reviews to ensure that costs incurred are within budget and the potential overruns are identified in a more timely fashion.

- Continue to improve its financial reporting and internal quality review procedures to reasonably assure that information presented in the Performance and Accountability Report is accurate and is consistent with the requirements of OMB Circular A-136, Financial Reporting Requirements, including rigorous use of checklist and supervisory review processes.

- Ensure that the Core Financial Module has been configured to provide a breakdown of net costs consistent with programs identified in NASA's strategic plan and in the Management's Discussion and Analysis (MD&A) section of the financial statements for both fiscal years presented.

- Continue to enhance its procedures related to confirming intra-governmental balances with its trading partners so that differences identified through the OMB quarterly process do not exist.

- Ensure that systems used to prepare the financial statements are complete and have been sufficiently tested prior to interim and year-end reporting dates. NASA should continue to validate its data within the Core Financial Module to resolve issues with data integrity that date back prior to the system conversion in FY 2003 to ensure that data is accurate and complete.

- Develop reports from the Core Financial Module to facilitate reviews and ensure that agings of transactions and open items, unliquidated obligations, grants, and other key areas are periodically assessed, researched, and resolved. Additionally, NASA should improve its process to more timely close expired travel, grants, and contracts and develop refined guidance on accounts receivable, the allowance for doubtful accounts, and the point when accounts receivable is either referred for collection initiatives or written off.

- Continue to devise short-term and long-term resolutions to systematic and integration issues that complicate use of the IEMP.

- Continue to resolve issues identified in the general and application controls surrounding its financial management systems. Additionally, in light of the financial management system upgrade, we recommend that NASA monitor that its internal control, including periodic reconciliations and analysis, are performed to ensure that further data conversion and other issues do not lead to difficulties in processing transactions and preparing accurate reports in the months and possibly the years to come.

- Continue to focus on filling key vacancies within the financial management organization to enhance overall performance and develop a core team of highly qualified individuals with experience in NASA's financial management processes.

- Continue to provide training for personnel – at Headquarters and center levels –to ensure that they understand their roles in processing transactions, performing account analyses and reconciliations, maintaining supporting documentation, and updating their knowledge of financial reporting requirements. Additionally, NASA should update guidance to ensure specific guidelines are documented as to the source of data, what comprises an exception/difference, required follow-up with timetables, and documentation retention policies.

Finally, as it relates to the estimation of environmental liabilities, we believe that estimating models and tools such as IDEAL are an accepted practice for improving the standardization of engineering estimates. Therefore, we recommend that if NASA continues to use IDEAL as part of its UEL estimation process, that it: (1) complete the verification and validation of the program; (2) encourage the IDEAL contractor to obtain a Type II SAS 70 from an independent third party service provider to demonstrate the operating effectiveness of its internal controls; (3) improve the security and controls of the application; and (4) develop a process to ensure consistent year-to-year audit trails and documentation.

We recommend continued involvement of the OCFO in the UEL process with specific focus on accounting related matters such as disclosure and documentation. We believe the center OCFO review can be enhanced with the inclusion of accounting related matters in its checklists. The OCFO review checklist should include a review of the determination that IDEAL's parametric data provides the best available estimate or that actual cost data is available that would provide a better estimate. We also recommend that NASA's OCFO continue to self-assess the UEL estimation and aggregation process to identify and correct remaining weaknesses in the UEL process.

Enhancements Needed for Controls Over Property, Plant, and Equipment and Materials (Modified Repeat Condition)

Consistent with prior year audit reports, our review of property, plant, and equipment (PP&E), totaling approximately $33.2 billion, identified serious weaknesses in internal control that, if not corrected, could prevent material misstatements from being detected and corrected in a timely manner. As stated in the prior year audit reports, NASA's current process for recognizing and accounting for fixed assets relies primarily on a retrospective review of disbursements to determine amounts which should be capitalized and continues to be heavily dependent on activities at its contractors to recognize any assets created at its contractors. Currently, NASA expenses all costs (except for certain construction of NASA-held real property) and then performs a review of the transactions to determine which costs should be capitalized. The subsequent review and dependence on contractor reporting increases the risk that related costs will not be properly captured and capitalized. Until NASA successfully implements an integrated system for reporting PP&E, and develops a methodology to identify costs that need to be capitalized starting at the budget/procurement cycle through to the processing and disbursing of funds as the transaction is processed, NASA will continue to experience difficulties in recording property-related balances and transactions. During fiscal year 2006, we were informed

that NASA has completed the first phase of its corrective action plan to flowchart and document the current business processes and procedures for each major category of PP&E. Somewhat simultaneously, NASA identified changes that needed to be made to existing policies Agency-wide and formed a cross-functional team to participate in working groups to re-engineer NASA's current processes and procedures and identify solutions to gaps in the PP&E lifecycle management. Pending implementation and acceptance of new policies and processes by all cross-functional departments within the agency of such overarching solutions, further emphasis on internal and external processes at headquarters, the centers, and the contractor locations is needed to ensure that amounts reported in its financial statements are reliable.

During our FY 2006 testing, we continued to note evidence of significant weaknesses in the property area. The weaknesses we noted during FY 2006, most of which are consistent with last year's audit report, fundamentally flow from not determining at the point of budget formulation, obligation recognition, contract development, accounts payable recognition, or disbursement the amounts of property NASA expects to buy, has contracted for, or has purchased. Rather, NASA waits until the entire transaction cycle is complete to obtain disbursement data for capitalization or, in the case of contractors, expects their contractors to do so. Insufficient internal controls surrounding contractor-held PP&E, NASA-held theme assets, NASA-held work in progress (WIP), and NASA-held real and personal property are addressed below:

Contractor-Held Property, Plant & Equipment

The reliance upon NASA's contractors to report property values at periodic intervals during the year without robust agency-wide detect controls to ensure the reliability and validity of those property values may increase the probability of errors and deficiencies not being detected by NASA or reported by contractors. Throughout the year, the Headquarters OCFO's property branch personnel do perform certain analytical analyses of property balances and transactions reported by NASA's largest contractors that report monthly in Contractor-Held Asset Tracking System (CHATS). This monitoring process, however, currently lacks integration of NASA's procurement and scientific community, with whom contractor accountability primarily resides, and does not include a reconciliation to the costs being incurred by these contractors via the monthly NF 533 reporting process to the property balances reported monthly in CHATS and annually via the NF 1018. Although the OCFO utilizes the Defense Contract Audit Agency (DCAA) as its primary quality assurance mechanism over NASA's contractors, the procedures that DCAA performed on the June 30, 2006 property balances and a sample of fiscal year 2006 transactions cannot alone be relied upon by NASA management to ensure the reliability and validity of contractor-held property values.

Recommendation

- We recommend that NASA fundamentally revisit its approach to capitalizing contractor-held property by documenting, analyzing, and implementing robust control changes from end to end, including the involvement of the procurement and scientific community.

- We continue to recommend that all NASA obligation documents and expenditures be coded to identify whether they relate to a property acquisition to create a record for comparison to recorded property transactions and the CHATS subsidiary ledger. For contractor-held property, this would also include developing a method for reconciling contractor costs incurred via the monthly NF 533 reporting process to those contractor-held property balances reported monthly in CHATS and annually via the NF 1018.

NASA-Held Theme Assets Operational and WIP

Beginning in FY 2004 and continuing throughout FY 2006, NASA has undertaken a project to review its policies (both accounting and procedural) with respect to theme assets to identify the specific types of costs that should be capitalized and those that should be expensed.

During fiscal years 2005 and 2006, NASA revisited its process to account for theme assets and developed a number of approaches, most recently positing its current position to the AAPC of the FASAB that nearly $12 billion of the theme asset activity is fundamentally research and development and that such costs should be expensed. The current position contrasts with earlier views that none or a small part of such activity constituted research and development, and is a significant potential change from prior approaches which led NASA to capitalize billions of dollars in such items. In any case, NASA will face challenges in addressing the question of whether certain land based assets so categorized with the theme assets that travel into space are so unique that the remaining technology and hardware are of no future use and cannot be salvaged or used in other research and development projects (a determining factor in NASA's proposed new approach on assessing whether costs should be capitalized). NASA management hopes to resolve the accounting policy-related aspects of its theme asset accounting independent of potentially longer-term needs to develop appropriate systems to capture such costs (however ultimately categorized). The specific rules for the AAPC to issue authoritative guidance which NASA management could follow in resolving the accounting issue is through a technical release approved by the FASAB, which has not yet occurred.

Management has begun to address the procedural matter, as discussed in previous years' reports, in establishing new policies by incorporating financial and engineering authoritative guidance as well as NASA program/project management policy to ensure consistent application and documentation. As one aspect of addressing the accounting issue over which costs are expensed versus capitalized for theme assets in progress and those yet to be undertaken, management implemented October 1, 2005, the revised the engineering authoritative guidance contained in NASA Procedural Requirement 7120.5C, *NASA Program and Project Management Processes and Requirements*. This requirement defined the four management requirements for formulating, approving, implementing, and evaluating NASA programs and projects and provided for an aligned budget structure and technical work breakdown structure within the Core Financial Module. These initiatives seem to be moving NASA in the right direction for identification of the component parts of theme assets throughout its life cycle. However, it is unclear as of yet how the alignment and the specificity of these pre-established work breakdown structure elements will correlate to the accounting for these costs under the authoritative literature.

Furthermore, NASA management has not yet demonstrated how these new requirements, when fully operational, will provide sufficient specificity in NASA's purchasing activity to facilitate tracking and reporting of all types of property acquisition activity, including the subset of such activity related to theme assets as projects are initiated and disbursements are made. Prior NASA efforts to obtain and retain documentation to support these assets under its existing policy created challenges.

Recommendation

- Once the process of exposing NASA's position relating to the accounting for theme assets to the authoritative standard setters has come to an end, we recommend that management act upon the final technical rulings issued by the AAPC and/or FASAB as promulgated by their charters.

- We continue to recommend that all NASA obligation documents and expenditures be coded to identify whether they relate to a theme asset property-related acquisition to create a record for comparison to recorded property transactions and the work breakdown structure (WBS) of costs incurred that result in capitalized theme assets. This would also include developing a method for reconciling costs incurred via the monthly NF 533 reporting process and recorded by WBS elements in the core financial module related to theme assets under construction (work-in-process) to the amounts reported monthly in CHATS or annually in the NF 1018, as well as the theme asset spreadsheet maintained by headquarters.

NASA-Held Real and Personal Property

During our FY 2006 testing, we again noted transactions that were not recorded at the appropriate value based upon the final amount paid to the vendor/contractor (i.e., a "three-way match" between the purchase order, shipping document, and invoice was not performed by NASA personnel), transactions were not recorded in the correct month and/or fiscal year based upon the date of authorized acceptance of the property, the initiation of transactions lacked evidence of written authorization or lacked required supporting evidence (i.e. invoices, contracts), and monthly journal vouchers lacked evidence of a supervisory review. NASA management is reliant upon a monthly evaluation to determine which assets should be capitalized to record these transactions and maintains separate subsidiary ledgers which are not interfaced directly with the Core Financial Module. Management records these property, plant and equipment transactions through a manual journal voucher process, yet there is no formal policy that requires supervisory review and signoff evidencing the approval of these entries prior to their posting in the Core Financial Module. It was noted that during the fiscal year, management recorded approximately $89 million (net) of adjustments for prior years' property transactions for such items as equipment found during routine inventory processes, components of buildings removed and no longer in use revealed during deferred maintenance reviews, and the discovery of manual input errors on key authorizing documents, such as one for $133

million, a result of an extra digit, not found when the transaction was originally recorded. There were also adjustments recorded at the headquarters' level relating to depreciation expense totaling approximately $24 million. All of these transactions were recorded through the current period operations. The result of these adjustments are further examples of management's need to place additional emphasis on strengthening and enforcing center-related manual prevent and detect controls that extend beyond the finance and logistics departments as these are the baseline controls upon which NASA is reliant. Furthermore, management should revisit their entity-level detect controls at the headquarters level to ensure that monthly reviews of center transactions and differences noted in subsidiary ledger reconciliations are reviewed, resolved, and communicated to center personnel in a timely manner for entry into the Core Financial Module or subsidiary ledgers.

Recommendation

We recommend that NASA management:

- Develop more robust center-related manual prevent and detect controls that extend beyond the finance and logistics departments, including a formal policy that requires supervisory review and signoff evidencing the approval of property, plant and equipment entries prior to their posting in the Core Financial Module.

- Revisit their entity-level detect controls at the headquarters level to ensure that differences and corrections are resolved and communicated timely to center personnel for entry into the Core Financial Module or subsidiary ledgers.

- Continue completing its implementation of suggested recommendations and developing detailed corrective action plans. In addition, we once again place further emphasis on recommending that NASA fundamentally revisit its approach to capitalizing property by documenting, analyzing, and implementing robust control changes from end to end to all categories of PP&E. We also recommend that all NASA obligation documents and expenditures be coded to identify whether they relate to a property acquisition to create a record for comparison to recorded property transactions and subsidiary ledgers, be they NASA activities or contractors.

OTHER MATTERS

Summary of FY 2005 Material Weaknesses and Reportable Conditions

Issue Area	Summary Control Issue	FY 2006 Status
Material Weaknesses		
Financial Systems, Analyses, and Oversight	Documentation regarding significant accounting events, recording of non-routine transactions, and post-closing adjustments, as well as corrections and other adjustments made in connection with data conversion issues, must be strengthened. Processes to prepare financial statements need improvement. Certain weaknesses noted relating to general and application controls.	Modified Repeat Condition.
Further Research Required to Resolve Fund Balance with Treasury Differences	Supporting documentation to support application of rigorous reconciliation processes was not available. Unreconciled differences were identified in the FY 2003-2005 year-end reconciliations.	Progress made; combined with Financial Systems, Analyses, and Oversight Weakness. Corrective actions related to suspense accounts, budget clearing accounts and unreconciled differences are needed.
Enhancements Needed for Controls over Property, Plant, and Equipment and Materials	Controls relating principally to contractor-held PP&E and materials and NASA-held assets in space and WIP need improvement; headquarters oversight needs improvement.	Modified Repeat Condition.
Reportable Condition:		
Internal Controls in Estimating NASA's UEL Require Enhancement	Weaknesses noted in NASA's ability to generate auditable UEL estimates using IDEAL estimating methodology and to identify disclosure items; and enhancing the independent quality review.	Progress made; combined with Financial Systems, Analyses, and Oversight Weakness. Corrective actions related to the IDEAL system and the level of the Office of the CFO participation are needed.

* * * * * * * * *

In addition, with respect to NASA's internal control over Required Supplementary Stewardship Information and performance measures reported in the Management's Discussion and Analysis, we were unable to apply certain procedures prescribed by OMB Bulletin No. 06-03, because of the limitations on the scope of the audit of the financial statements, as discussed in our Report of Independent Auditors, dated November 3, 2006. Further, we did not audit and do not express an opinion on such controls.

We also noted certain other matters involving internal control that we will report to NASA management in a separate letter dated November 3, 2006.

This report is intended solely for the information and use of the management and the OIG of NASA, OMB, and Congress and is not intended to be and should not be used by anyone other than these specified parties.

Ernst + Young LLP

November 3, 2006
Washington, D.C.

ERNST & YOUNG

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Report on Compliance with Laws and Regulations

To the Administrator and the Office of Inspector General
of the National Aeronautics and Space Administration

We were engaged to audit the financial statements of the National Aeronautics and Space Administration (NASA) as of and for the year ended September 30, 2006, and have issued our report thereon dated November 3, 2006. The report states that because of the matters discussed therein, the scope of our work was not sufficient to enable us to express, and we do not express, an opinion on the consolidated balance sheet as of September 30, 2006, and the related consolidated statements of net cost, changes in net position and financing and combined statement of budgetary resources for the fiscal year then ended.

The management of NASA is responsible for complying with laws and regulations applicable to NASA. We performed tests of its compliance with certain provisions of laws and regulations, noncompliance with which could have a direct and material effect on the determination of financial statement amounts, and certain other laws and regulations specified in Office of Management and Budget (OMB) Bulletin No. 06-03, *Audit Requirements for Federal Financial Statements*, including the requirements referred to in the Federal Financial Management Improvement Act of 1996 (FFMIA). We limited our tests of compliance to these provisions, and we did not test compliance with all laws and regulations applicable to NASA.

The results of our tests disclosed two instances of potential noncompliance with the laws and regulations discussed in the preceding paragraph, exclusive of FFMIA, that are required to be reported under *Government Auditing Standards* or OMB Bulletin No. 06-03. First, NASA's management has determined that it has violated certain provisions of the Anti-Deficiency Act (P.L. 101-508 and OMB Circular A-11). We have been advised that appropriate reporting of the violation was performed during October 2006. Additionally, NASA has potentially violated certain requirements of the Improper Payments Information Act of 2002. During FY 2006, NASA management was unable to provide sufficient documentation to support performance of an annual review of all programs and activities that it administers to identify all such programs and activities that may be susceptible to significant improper payments. NASA management indicated that an assessment was performed to estimate an error rate on research and development contracts related to payments between FY 1997 and FY 2005.

Under FFMIA, we are required to report whether NASA's financial management systems substantially comply with federal financial management systems requirements, applicable federal accounting standards, and the United States Standard General Ledger (SGL) at the transaction level. To meet this requirement, we performed tests of compliance with FFMIA Section 803(a) requirements. However, as noted above, we were unable to complete our audit. Based upon the results of the tests we were able to complete, we noted certain instances, described below, in which NASA's financial management systems did not substantially comply with certain requirements:

- The NASA accounting system does not conform to certain Federal requirements. NASA's management continues to identify data integrity and configuration issues in the Core Financial Module, which results in inappropriate transactional postings. Additionally, certain subsidiary systems, including property, are not integrated with the Core Financial Module and are not complemented by sufficient manual preventative and detect type controls.

- Data within NASA's financial system have not been validated as reliable and may not be reliable to support NASA's financial statements. Additionally, certain data was not readily available to adequately support sufficient reconciliations and analyses of significant fluctuations in account balances, with fluctuation review processes impeded by acknowledged deficiencies in baseline information used in comparisons.

- Reviews of general and application controls over financial management systems identified certain departures from requirements specified in OMB Circular A-127, *Financial Management Systems*, and OMB Circular A-130, *Management of Federal Information Resources*. Additionally, the Office of Inspector General of NASA (OIG) identified certain issues related to systems as part of its Federal Information Security Management Act (FISMA) and other OIG projects.

- As part of its FMFIA self assessment, NASA management has identified its financial management system as a material weakness. NASA management indicated that since the completion of the roll-out of the Integrated Enterprise Managements Program's (IEMP) core financial management system, challenges in system processes, configuration, and capabilities have surfaced. They believe that the current IEMP software system has certain capability limitations which require compensating controls which have not been fully implemented.

The Report on Internal Control and management letter include information related to the financial management systems that were found not to comply with the requirements, relevant facts pertaining to the noncompliance, and our recommendations related to the specific issues presented. It is our understanding that NASA's management agrees with the facts as presented and that relevant comments from NASA's management responsible for addressing the noncompliance are provided as an attachment to this report.

Because we could not complete our audit, we were unable to determine whether there were other instances of noncompliance with laws and regulations that are required to be reported.

Providing an opinion on compliance with certain provisions of laws and regulations was not an objective of our audit, and accordingly, we do not express such an opinion.

This report is intended solely for the information and use of management and the Office of Inspector General of NASA, OMB, and Congress, and is not intended to be and should not be used by anyone other than these specified parties.

Ernst + Young LLP

November 3, 2006
Washington, D.C.

Chief Financial Officer's Response to the Audit Report of the Independent Auditors

National Aeronautics and
Space Administration
Headquarters
Washington, DC 20546-0001

November 8, 2006

Reply to Attn of: The Office of the Chief Financial Officer

TO: Inspector General

FROM: Chief Financial Officer

SUBJECT: Management Response to Audit Report of Independent Auditors

We appreciate the efforts of the Office of Inspector General (OIG), and of the independent auditors under contract to the OIG, to audit NASA's FY 2006 and FY 2005 financial statements. We understand that, due to the continued evolution of NASA's internal controls and financial reporting processes, the independent auditor determined that there was insufficient evidence to support the financial statements. This lack of evidence prevented the auditor from expressing an opinion on the consolidated balance sheets, and the related consolidated statements of net costs, changes in net position and financing, and combined statements of budgetary resources.

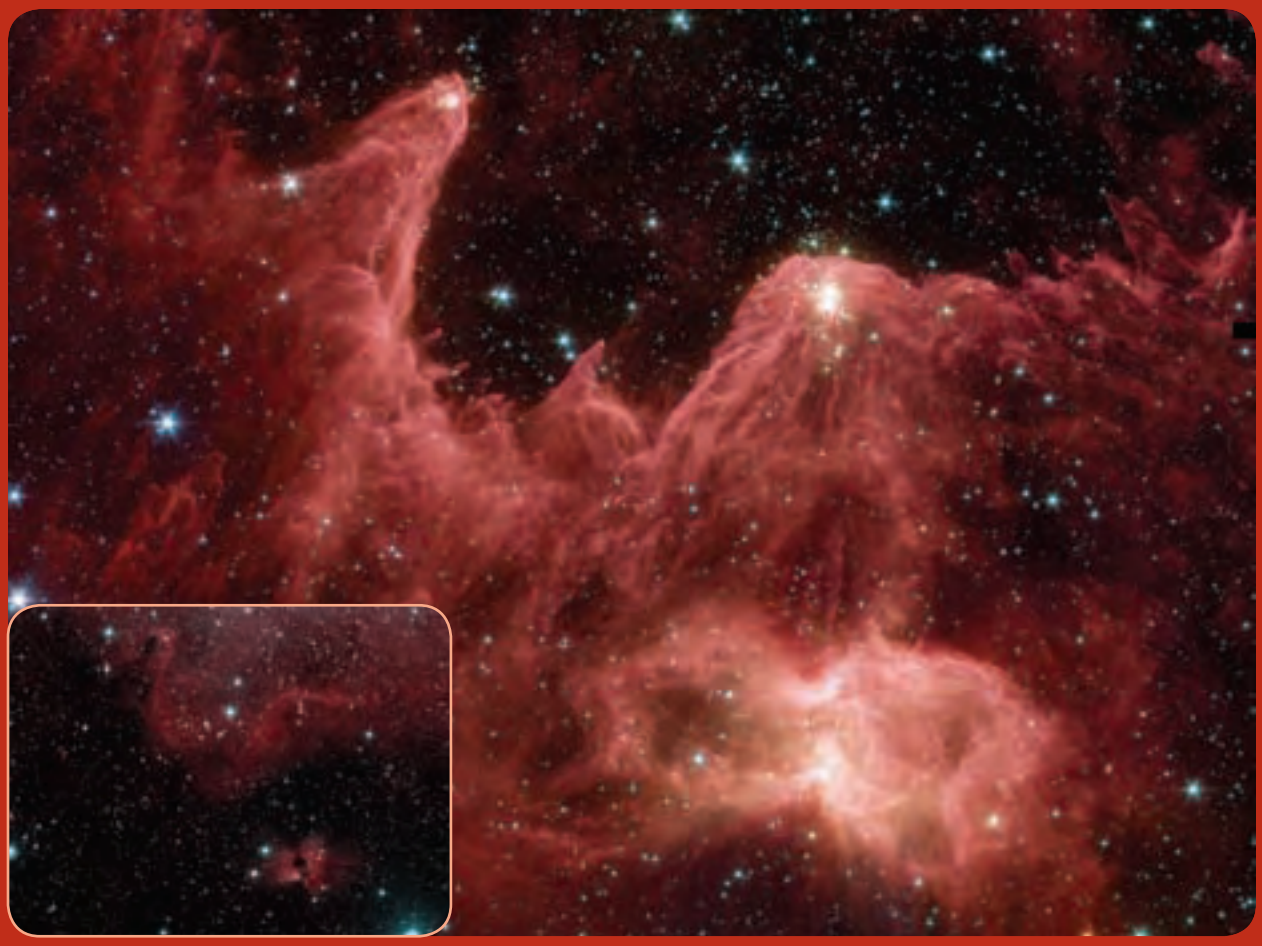
The *Report on Internal Control* reflects the progress NASA has made in 2006 by removing Fund Balance with Treasury, a 2005 material weakness, and Estimation of Unfunded Environmental Liabilities, a 2005 reportable condition. The report identified two material weaknesses that continue to be challenges for the Agency: Financial Systems, Analyses, and Oversight; and, Enhancements Needed for Controls over Property, Plant, and Equipment and Materials. NASA will continue to address these remaining issues through NASA's 2007 Financial Audit Corrective Action Plan.

We further appreciate the specific examples of control weaknesses across NASA business areas provided in the auditor's reports. This additional level of specificity, both in general topic area and in specific instance, will be helpful as we move forward in our improvement efforts. This is particularly true in the area of Property, Plant, and Equipment, where we will continue to seek your opinion as we implement the anticipated Accounting and Audit Policy Committee (AAPC) or Federal Accounting Standards Advisory Board (FASAB) guidance for theme asset accounting.

We remain committed to working closely over the coming year with you and your staff as we continue to improve NASA's financial management.

Gwendolyn Sykes

Appendices



Previous page: Six hundred and fifty light-years away in the constellation Aquarius, a dead star about the size of Earth called the Helix Nebula is refusing to fade away peacefully. In death, it is spewing out massive amounts of hot gas and intense ultraviolet radiation, creating a spectacular object called a "planetary nebula." In this false-color image, NASA's Hubble and Spitzer Space Telescopes have teamed up to capture the complex structure of the object in unprecedented detail.

The dead star, called a white dwarf, can be seen at the center of the image as a white dot. The intense ultraviolet radiation being released by the white dwarf is heating and destabilizing the molecules in its surrounding environment. Very hot gases (blue) are in the center. As gases move away from the center, they transition from hot (yellow) to warm (red). A striking feature of the Helix is its collection of thousands of filamentary structures, or strands of gas. In this image, the filaments can be seen under the transparent blue gas as red lines radiating out from the center. Astronomers believe that the molecules in these filaments are able to stay cooler and more stable because dense clumps of materials are shielding them from ultraviolet radiation. (NASA/JPL–Caltech/ESA/J. Hora, Harvard–Smithsonian CfA/C.R. O'Dell, Vanderbilt Univ.)

Above: These images compare a visible-light image (inset) taken by the California Institute of Technology's Digitized Sky Survey with an infrared image taken by NASA's Spitzer Space Telescope. While the visible-light view shows hints of dusty pillars, the infrared view, dubbed "Mountains of Creation," reveals towering pillars of dust aglow with the light of embryonic stars (shown in white and yellow). The added detail in the Spitzer image reveals a dynamic region in the process of evolving and creating new stellar life. (Inset: DSS; Spitzer image: NASA/JPL–Caltech/L. Allen, Harvard–Smithsonian CfA)

Appendix A: Audit Follow-up Actions

The Inspector General Act Amendments

The *Inspector General Act of 1978* (as amended), requires that the head of each federal agency make management decisions on all audit recommendations issued by the Office of Inspector General (OIG) within a maximum of six months after the issuance of an audit report. The Act further requires that the head of each federal agency complete final action on each management decision required with regard to a recommendation in an OIG report within 12 months after issuance of a report.

The *Inspector General Act Amendments of 1988* (P.L. 100-504), require that federal agency heads report on the status of management decisions and final management action with regard to audit reports issued by the OIG. Under the *Reports Consolidation Act* (RCA) of 2000, NASA consolidates and annualizes all relevant information on final management decisions and final management action for inclusion in the annual Performance and Accountability Report (PAR). Following is NASA's submission in compliance with these requirements.

Report on Audit Follow-up

NASA management is committed to ensuring the timely resolution (management decision) and implementation of OIG audit recommendations and believes that audit follow-up is essential to improving the efficiency and effectiveness of NASA programs, projects, and operations. Therefore, NASA has implemented a comprehensive program of audit liaison, resolution, and follow-up to assure that OIG audit recommendations are resolved and implemented promptly.

NASA uses the Corrective Action Tracking System version 2.0 (CATS II), as the Agency's primary database for monitoring the status of OIG audit recommendations. CATS II is a Web-based application developed and managed by NASA.

NASA's program of audit follow-up is a joint effort between NASA management and the NASA OIG. Periodic reconciliations between the OIG's Office of Audits Central Information System (OACIS) and NASA's CATS system assure complete and accurate status reporting of open OIG audit reports and related recommendations.

During FY 2006, the Office of Infrastructure and Administration, Management Systems Division partnered with the NASA Office of Inspector General, Quality Assurance Directorate on a joint effort to conduct post-closure follow-up reviews to assess the efficiency and effectiveness of agency audit follow-up processes and to identify trends and/or systemic deficiencies. Reviewers derived their objectives from requirements outlined in the Office of Management and Budget's (OMB) Circular A-50, "Audit Follow-up," dated September 29, 1982. The scope of the work performed was limited to NASA OIG audit recommendations resolved and closed during the period January 1, 2000 through December 31, 2005. On September 11, 2006, the Management Systems Division issued its initial report on post-closure follow-up. The report concluded that while the work performed by the Management Systems Division did not support a conclusion as to the overall effectiveness and efficiency of NASA's audit follow-up system in its entirety, the system did assure the efficient, prompt, and proper resolution and implementation of corrective action on the recommendation included in the review. Furthermore, there was no indication of recurring deficiencies or systemic trends relating to the subject matter reviewed (NASA's foreign national management system).

Reports Pending Final Management Decision Six Months or More After Issuance of a Final Report

As of September 30, 2006, there were no audit recommendations issued by the NASA Office of Inspector General for which a final management decision had not been made within six months of issuance of a final audit report.

Reports Pending Final Management Action One Year or More After Issuance of a Management Decision

As of September 30, 2006, the NASA OIG has issued a total of 13 audit reports containing 53 audit recommendations on which final management decisions have been made, but final management action is still pending. For comparative purposes, as of September 30, 2005, the NASA OIG issued 15 audit reports containing 40 audit recommendations on which final management decisions were made, but final management action was pending.

Delays in implementation of final management action stem from the development and implementation of NASA policy or procedural requirements or implementation of system changes. Management continues to address the recommendations put forth by the OIG, and the Agency is actively implementing those recommendations as expeditiously as possible.

OIG Audit and Inspection Reports Pending Final Management Action One Year or More after Issuance of a Management Decision
(As of September 30, 2006)

Report No./ Report Date	Report Title	No. Recommendations	
		Open	Closed
G00017 / 10-22-2001	Internet Based Space Craft Commanding	1	3
IGFS04 / 1-23-2003	Fiscal Year 2002 Financial Statement Audit Report (PAR)	1	9
IGFS03 / 01-18-2004	Fiscal Year 2003 Management Letter Comments (Financial)	2	6
IGFS02 / 01-28-2004	Fiscal Year 2003 Management Letter Comments (Information Technology)	7	64
IGFS01 / 01-28-2004	Audit of NASA's Fiscal Year 2003 Financial Statements (PAR)	5	13
IG-04-025 / 09-07-2004	NASA's Implementation of the Mission Critical Space System PRP	3	3
FSMEMO04 / 10-29-2004	Fiscal Year 2004 NASA Financial Statement Audit (Information Technology)	7	55
FSMEMO02 / 10-29-2004	Fiscal Year 2004 NASA Financial Statement Audit (Environmental Liability Comments)	18	0
FSMEMO01 / 10-29-2004	Fiscal Year 2004 NASA Financial Statement Audit (PAR)	4	8
IG-05-011 / 03-28-2005	Audit of Information Assurance Controls in the Flight Project Ground Data System at JPL	1	24
IG-05-013 / 03-30-2005	Review of IT Security Structure at NASA Centers	1	1
IG-05-016 / 05-12-2005	Audit of NASA's Information Technology Vulnerability Assessment Process	1	3
IG-05-025 / 09-16-2005	NASA's Performance Measure Data Under the *Federal Information Security Management Act* (FISMA)	2	3
13	**Totals**	**53**	**192**

Disallowed Costs and Funds Put to Better Use October 1, 2005 - September 30, 2006				
Category	Disallowed Costs		Funds Put to Better Use	
	Number	Value	Number	Value
A.) Audit reports with management decisions but without final action completed at the beginning of the reporting period.	25[1]	$0	0	$0
B.) Audit reports on which management decisions were made during the reporting period.	28	$0	1	$24,000
C.) Total audit reports pending final action during the reporting period (A + B).	53	$0	1	$24,000
D.) Audit reports on which final action was taken during the reporting period:				
1. Recoveries:				
(a) Offsets	0	$0	0	$0
(b) Collections	0	$0	0	$0
(c) Property	0	$0	0	$0
(d) Other	18	$0	0	$0
2. Write-offs.	0	$0	0	$0
3. Value of recommendations implemented.	0	$0	1	$24,000
4. Value of recommendations management decided should/could not be implemented.	0	$0	0	$0
E.) Audit reports pending final action at the end of the reporting period (C - D).	35	$0	1	$0

1. Restated beginning balance of audit reports with management decisions made, but without final action completed.

Appendix B: FY 2005 Performance Improvement Plan Follow-up

NASA is a research and development agency, therefore projects usually span years or even decades, and it is often difficult to assess annual progress. NASA reviews deficiencies reported in the annual performance plan and tracks the progress of remedial actions taken to correct these shortcomings.

The following table presents FY 2005 Annual Performance Goals (APGs) that were rated Yellow or Red, the plans and schedules to correct the goal as presented in the FY 2005 Performance Improvement Plan, and the results of FY 2006 follow-up actions. Further information on on-going projects is included in Part 2: Detailed Performance Data.

Objective	Performance Measure	Description	Rating	Explanation/ description of where a performance goal was not met	Why the goal was not met	Plans and schedules for achieving the goal
2	APG 5MEP4	Successfully complete the Preliminary Mission System Review (PMSR) for the 2009 Mars Science Laboratory (MSL) Mission.	Yellow	NASA postponed the Preliminary Mission System Review (PMSR) for the 2009 Mars Science Laboratory.	NASA decided to delay in order to complete independent cost estimates prior to the review. The mission schedule allowed for this delay with no impact.	The PMSR currently is scheduled for December 2005, with no impact to the mission launch date.
FY 2006 Follow-up						
NASA completed the Preliminary Mission System Review (PMSR) on December 7-9, 2005. The delay did not impact the mission launch date.						
2	APG 5MEP11	Successfully demonstrate progress in investigating the character and extent of prebiotic chemistry on Mars. Progress towards achieving outcomes will be validated by external review.	Yellow	The external expert review determined that NASA did not demonstrate sufficient progress in investigating the character and extent of prebiotic chemistry on Mars.	The external expert review determined that NASA did not demonstrate sufficient progress due to a lack of currently operating flight missions designed to address this Outcome.	As noted by the external review, the Mars Science Laboratory, scheduled for launch in 2009, will address this Outcome.
FY 2006 Follow-up						
As noted in the external review, the Mars Science Laboratory will address this Outcome. Launch is scheduled for fall 2009.						
2	APG 5MEP14	Successfully demonstrate progress in inventorying and characterizing Martian resources of potential benefit to human exploration of Mars. Progress towards achieving outcomes will be validated by external review.	Yellow	The external expert review determined that NASA did not demonstrate sufficient progress toward achieving this APG.	The external expert review determined that NASA did not make sufficient progress due to a lack of currently operating flight missions designed to address this Outcome.	As noted by the external review, the Mars Reconnaissance Orbiter, launched in August 2005, will address this Outcome.
FY 2006 Follow-up						
As noted in the external review, Mars Reconnaissance Orbiter (MRO) will address this science Outcome. NASA placed MRO in orbit during FY 2006 and the spacecraft is returning high resolution, low-altitude images to Earth.						

Objective	Performance Measure	Description	Rating	Explanation/ description of where a performance goal was not met	Why the goal was not met	Plans and schedules for achieving the goal
2	APG 5SSE9	Successfully demonstrate progress in understanding why the terrestrial planets are so different from one another. Progress towards achieving outcomes will be validated by external review.	Yellow	The external expert review determined that NASA did not make sufficient progress toward achieving this APG.	The external expert review determined that NASA did not make sufficient progress due to the lack of flight missions planned to address this Outcome in general and Venus in particular.	NASA has included Venus investigations as an explicit target in the New Frontiers Program.
FY 2006 Follow-up						
NASA-funded investigators are participating in the European Space Agency's Venus Express mission. Venus Express, launched in November 2005, arrived at Venus in April and is currently orbiting the planet, studying its atmosphere in great detail. In addition, under the Discovery Program 2006 Announcement of Opportunity, NASA selected for concept study a return to Venus mission. "Vesper", the Venus Chemistry and Dynamics Orbiter, proposes to significantly advance our understanding of the atmospheric composition and dynamics of Venus, especially its photochemistry. Successful completion of the Phase A concept study would allow continuation into a Phase B full design effort.						
4	APG 5ASO4	Demonstrate James Webb Space Telescope (JWST) primary mirror technology readiness by testing a prototype in a flight-like environment.	Yellow	NASA has completed only partially testing of JWST primary mirror technology in a flight-like environment.	NASA tested the advanced mirror system demonstrator (ASMD) mirror to operating temperature, but not to flight-like mechanical loads.	NASA will test the prototype and flight spare engineering development units mirror segment to all flight conditions by summer 2006, bringing it to Technology Readiness Level 6.
FY 2006 Follow-up						
NASA completed testing of the JWST primary mirror by July 2006.						
4	Outcome 4.7	Tace the chemical pathwaysby which simple molecules and dust evolve into the organic molecules important for life.	Yellow	See 5ASO1 below.	See 5ASO1 below.	See 5ASO1 below.
4	APG 5ASO1	Deliver the SOFIA Airborne Observatory to Ames Research Center for final testing.	Red	SOFIA Airborne Observatory has not been delivered to Ames for final testing.	The SOFIA mission has experienced significant delays over the last several years from a variety of causes; the delay to completing the FY 2005 APG represents the effect of delays in prior years, acknowledged and explained in prior year's reports.	Delivery will occur in FY 2007.
FY 2006 Follow-up						
NASA restructured the program at Dryden Flight Research Center (DFRC) providing direct management of the SOFIA airborne system development and flight testing. DFRC will receive the system in FY 2007.						
5	APG 5SEU8	Successfully demonstrate progress in testing Einstein's theory of gravity and mapping space–time near event horizons of black holes. Progress towards achieving outcomes will be validated by external review.	Yellow	The external expert review determined that progress toward achieving this APG was significantly affected by the loss of the XRS-2 instrument on the Astro-E2/ Suzaku mission.	Progress toward achieving this APG was affected by the loss of the XRS-2 instrument on the Astro-E2/ Suzaku mission.	A Mishap Investigation Board is assessing the causes of the failure. NASA may try to obtain the XRS science in the future, but NASA must evaluate this effort as part of the normal budget prioritization process.
FY 2006 Follow-up						
The Mishap Investigation Board report is not complete; however, preliminary results show the cause of the malfunction was a design flaw in the cryogenic system. The investigation also identified several concerns with mission level system engineering, and limitations of the ground testing and review processes. The JAXA Mishap Investigation Board has concluded its work, and the NASA Mishap Investigation Board is close to delivering its final draft report. NASA will use recommendations to improve future international collaborations.						

Objective	Performance Measure	Description	Rating	Explanation/ description of where a performance goal was not met	Why the goal was not met	Plans and schedules for achieving the goal
5	APG 5SEU1	Complete the integration and testing of the Gamma-ray Large Area Space Telescope (GLAST) spacecraft bus.	Yellow	NASA did not complete integrating and testing the GLAST spacecraft bus.	Delays were due to schedule problems with GLAST's primary instrument, the Large Area Telescope (LAT). The LAT experienced both engineering design and electrical parts problems, which required a project schedule and cost rebaseline.	NASA will integrate and test the spacecraft bus in FY 2006. The rebaseline resulted in a delay to the launch date, from May 2007 to September 2007.
FY 2006 Follow-up						
NASA will complete integration and testing of the spacecraft bus in early FY 2007. The GLAST mission is scheduled to launch November 15, 2007.						
6	APG 5SSP2	Achieve an average of eight or fewer flight anomalies per Space Shuttle mission in FY 2005.	Red	There was one Space Shuttle mission in FY 2005: STS-114. For this mission, there were approximately 185 In-Flight Anomalies (IFAs) reported. This number is approximate since post-STS-114 hardware inspections and analyses continue; these results could generate additional IFAs as the process unfolds.	A key contributor to the unusually large number of IFAs for STS-114 was a change in the definition of an IFA made during the Return to Flight effort. The change is documented in NSTS 08126, Problem Reporting and Corrective Action (PRACA) System Requirements, which became effective on August 27, 2004. Prior to this change in definition, IFAs were a small subset of problems reported in the PRACA system; with this change, any PRACA-reportable item during the launch preparation and execution time-frame automatically becomes an IFA. This change was made as part of the overall improvement to the Space Shuttle Program's problem tracking, IFA disposition and was documented in NASA's Implementation Plan for Space Shuttle Return to Flight and Beyond. The Columbia Accident Investigation Board recommended anomaly resolution processes.	This performance goal has been eliminated for FY 2006.
FY 2006 Follow-up						
As stated in the FY 2005 Performance Improvement Plan, NASA eliminated this performance goal.						
8	APG 5ISS5	Obtain agreement among the International Partners on the final ISS configuration.	Yellow	The ISS International Partnership Heads of Agency did meet in January 2005 to endorse the Multilateral Coordination Board-approved ISS configuration. However, in May 2005, Administrator Griffin initiated a 60-day study on options for completing ISS assembly within the parameters of the Vision for Space Exploration. The decision based on the study requires NASA to reopen discussions with its partners. By the end of the fiscal year, NASA began discussions with the International Partners on the way forward.	In May 2005, NASA initiated the Shuttle/Station Configuration Options Team study. This team conducted a 60-day study of the configuration options for the ISS and assessed the related number of flights needed by the Space Shuttle before it retires, no later than the year 2010. The scope of the team study spans ISS assembly, operations, and use and considers such factors as international partner commitments, research utilization, cost, and ISS sustainability. Decisions based on the study have required that NASA reopen discussions with its International Partners.	NASA proposed that the ISS Multilateral Coordination Board convene in late October 2005 to discuss the proposed configuration and assembly sequence and that the board, in turn, task and oversee the work of the Space Station Control Board to assess the technical aspects of this new approach. Following these detailed discussions, the partnership will meet at the Heads of Agency level.
FY 2006 Follow-up						
International Partners at the Heads of Agency meeting approved final configuration on March 2, 2006.						

Objective	Performance Measure	Description	Rating	Explanation/ description of where a performance goal was not met	Why the goal was not met	Plans and schedules for achieving the goal
8	APG 5ISS2	Achieve zero Type-A (damage to property at least $1 M or death) or Type-B (damage to property at least $250 K or permanent disability or hospitalization of 3 or more persons) mishaps in FY 2005.	Yellow	Although there were no Type-A mishaps in FY 2005, NASA failed to achieve this APG due to the occurrence of one Type-B mishap.	The Precooler Assembly, part of the Environmental Control and Life Support System (ECLSS) flight hardware, was damaged during the tin plating process, damaging the protective braze layer. This breach rendered the assembly unrecoverable and will result in NASA requesting additional unit(s) from the ISS Program. The value of the loss is approximately $350 K. A Mishap Investigation Board is investigating the mishap.	NASA will review the ECLSS mishap investigation report for applicable lessons learned.
FY 2006 Follow-up						
NASA implemented lessons learned from the mishap. For FY 2006 there were no Type A or B mishaps in the ISS program.						
8	APG 5ISS4	Provide at least 80% of upmass, volume, and crew time for science as planned at the beginning of FY 2005.	Yellow	While NASA did not meet the 80% goal as planned at the beginning of the fiscal year on these metrics. NASA did meet 97% of the science objectives during Increment 10 (October 2004–March 2005) and expect a similar achievement for Increment 11 (March–October 2005). In addition, STS 114 delivered additional science capacity to the Station, bringing up the Human Research Facility-2 rack for the U.S. Destiny lab, deploying another set in an on-going material experiment, and flying three additional sortie experiments.	Due to the delay of Shuttle flight mission UF1 from March to July, the increase to three crewmembers was delayed from the scheduled date of May 2005 to a date to be determined in 2006, preventing achievement of the planned crew time and up-mass for science goal.	A second successful test flight of the Space Shuttle will enable NASA to meet the planned science up-mass and volume goals, as well as an increase to three crewmembers.
FY 2006 Follow-up						
NASA was unable to meet the original goal of regularly scheduled Shuttle flights throughout FY 2006 due to foam issues on the external tank. While these issues were resolved, NASA did not launch the Shuttle until July 2006—10 months after the start of FY 2006. Shuttle flight delays significantly reduced actual upmass and volume capabilities.						
11	APG 5LE1	Identify and define preferred human–robotic exploration systems concepts and architectural approaches for validation through lunar missions.	Yellow	NASA does not have complete results, only preliminary concepts. NASA's near-term focus is on lunar site selection and characterization, rather than human–robotic linkages.	The architecture and long-term linkages must flow from the Exploration Systems Architecture Study results, which was completed in August 2005.	NASA intends to complete this APG in the third quarter of FY 2006.
FY 2006 Follow-up						
NASA did not meet the schedule for achieving this goal. NASA will complete this APG in December 2006 as part of the Lunar Architecture activity with periodic updates every 2 years.						

Objective	Performance Measure	Description	Rating	Explanation/ description of where a performance goal was not met	Why the goal was not met	Plans and schedules for achieving the goal
11	APG 5LE2	Identify candidate architectures and systems approaches that can be developed and demonstrated through lunar missions to enable a safe, affordable, and effective campaign of human–robotic Mars exploration.	Red	NASA's near-term focus has been lunar exploration; extensibility to Mars needs further work.	NASA deferred linkage to Mars in order to re-allocate resources for Constellation Systems development.	Although the schedule is unclear, NASA does not anticipate completing this APG before FY 2007.
FY 2006 Follow-up						
NASA does not anticipate completing APG 5LE2 before FY 2007.						
11	APG 5LE6	Identify preferred approaches for development and demonstration during lunar missions to enable transformational space operations capabilities.	Yellow	NASA has conducted limited analysis of space operations.	NASA's near-term focus for robotic exploration is on site selection and characterization. NASA will derive linkage to transformational operations from the Exploration Systems Architecture Study results and architecture development.	NASA intends to complete this APG in the third quarter of FY 2006.
FY 2006 Follow-up						
NASA did not meet the schedule for achieving this goal. This APG will be complete in December 2006 as part of the Lunar Architecture activity with periodic updates every 2 years.						
11	APG 5HRT12	Establish three partnerships with U.S. industry and the investment community using the Enterprise Engine concept.	Yellow	NASA did not form any partnerships with industry or the investment community using the Enterprise Engine concept in FY 2005.	Not applicable.	The program was restructured and is in place for FY 2006.
FY 2006 Follow-up						
In August 2006, NASA executed a Space Act Agreement with a nonprofit entity, Red Planet Capital, for the establishment and management of NASA's strategic venture. Red Planet Capital received initial funding from NASA in September 2006. NASA is looking at investment opportunities.						
12	APG 5AT5	Demonstrate 70% reduction NOx emissions in full-annular rig tests of candidate combustor configurations for large subsonic vehicle applications. (Vehicle Systems)	Red	NASA originally funded three companies to demonstrate 70% NOx reduction, but only one successful annular rig test is needed to meet this APG's minimum success exit criteria. The curtailment of FY05 funding and the earmarks have severely impacted the UEET Project, including the Low-NOx Combustor DDR milestone that was planned for completion during the second quarter of 2005. One contractor (P&W) did complete DDR of their concept in February 2005 and is continuing with testing as remaining UEET funds run out.	Because of NASA's decision to levy Propulsion 21 earmark entirely against the UEET Project, stop-work orders were issued.	GE will continue low-NOx combustion work under the Propulsion 21 funding, but their schedule for DDR will slip into FY 2006. The P&W funding situation will be monitored. Final termination decisions and notices are pending.
FY 2006 Follow-up						
NASA terminated work towards this milestone during the restructuring of the Vehicle Systems Program into the Fundamental Aeronautics Program.						

Objective	Performance Measure	Description	Rating	Explanation/ description of where a performance goal was not met	Why the goal was not met	Plans and schedules for achieving the goal
12	APG 5AT22	Using laboratory data and systems analysis, complete selection of the technologies that show the highest potential for reducing takeoff/landing field length while maintaining cruise Mach, low speed controllability, and low noise.	Yellow	This APG was not completed in FY 2005 due to substantially limited FY 2005 discretionary procurement budget that was caused by the requirement to fund Congressional Special Interest items. The work is expected to be completed in FY 2006. Limited internal studies are on-going.	NASA did not fund any external trade studies in FY 2005.	Progress toward achieving this detail is pending changes of Demonstration focus with the Vehicle Systems Program in FY 2006.
FY 2006 Follow-up						
Work towards this milestone ended during the restructuring of the Vehicle Systems Program into the Fundamental Aeronautics Program.						
12	APG 5AT20	Complete flight demonstration of a second generation damage adaptive flight control system. (Vehicle Systems)	Yellow	Although NASA is making good progress toward developing second-generation flight software, a reduction of $1.25 M in procurement funds, for Congressional Special Interest items, will impact completion of the APG. The result is a delayed software delivery schedule and the delayed start of the second-generation flight demonstration.	This APG was not met due to a $1.25 M reduction in available procurement funds.	NASA will reduce the scope of the flight demonstration to limited flight envelope testing. NASA will not demonstrate the full capability of the damage adaptive control system. However, NASA made signficant progress and plans to achieve the APG, based on the new scope, within the first quarter of FY 2006.
FY 2006 Follow-up						
The F-15 837 team conducted 17 flights during FY06 to validate the ability of a second generation damage adaptive flight control system to improve aircraft handling qualities with a simulated failure. This APG has been successfully completed.						
15	APG 5SEC1	Complete Solar Terrestrial Relations Observatory (STEREO) instrument integration.	Yellow	NASA completed over 90% of Instrument integration for STEREO. All U.S. instruments have been integrated on both spacecraft. Two Heliospheric Imager (HI) instruments being provided by an international partner muar be integrated. The HI-A instrument has been delivered to the spacecraft, but technical problems have delayed integration until early October 2005. HI-B delivery is planned for November 2005.	The international partner encountered numerous technical problems associated with the Heliospheric Imager instruments, resulting in significant schedule slips.	The mission team is using schedule workarounds, weekend work, and double shifts to minimize schedule delays. An HI mass model is being used on the "B" spacecraft so that observatory testing can proceed. The STEREO launch readiness date of April 2005 is unlikely due to these HI instrument delays.
FY 2006 Follow-up						
NASA completed integration of both instruments in November and December 2005. STEREO launched on October 25, 2006.						
17	APG 5ISS7	Baseline a strategy and initiate procurement of cargo delivery service to the ISS.	Yellow	NASA completed the strategy, but has not initated procurement.	NASA is still awaiting detailed requirements from the Exploration Requirements Transition Team (expected in December).	NASA plans to initiate procurement by the second quarter of FY 2006.
FY 2006 Follow-up						
NASA signed Space Act Agreements in FY 2006 for two companies to demonstrate commercial orbital transportation services capability. Once demonstrated, NASA plans to competitively purchase cargo delivery services.						

Objective	Performance Measure	Description	Rating	Explanation/ description of where a performance goal was not met	Why the goal was not met	Plans and schedules for achieving the goal
Efficiency Measure	APG 5SSP4	Complete all development projects within 110% of the cost and schedule baseline.	Yellow	Deployment of the Space Shuttle main engine Advanced Health Monitoring System (AHMS) slipped 21 months. Deployment to the fleet is now scheduled for July 2006. The project remains within overall budget.	Work on AHMS was interrupted to support testing and processing of Shuttle main engines for return to flight. The July 2006 date could also be delayed due to the effects of Hurricane Katrina on main engine testing facilities and delays in liquid hydrogen production and shipments to the Stennis Space Center in Mississippi.	Processing of the main engines for return to flight is complete, and testing facilities at the Stennis Space Center are coming back online after Hurricane Katrina. NASA is working with local and national distributors to secure shipments of liquid hydrogen fuel to complete AHMS certification testing.
FY 2006 Follow-up						
NASA completed AHMS testing and certification on August 9, 2006. NASA will install the first AHMS controller in monitoring mode on one of the three main engines of the Space Shuttle Discovery for STS-116, which is scheduled to launch in December, 2006. AHMS will be fully deployed on all Space Shuttle main engines starting with STS-117 in 2007. The project remains under its budget of $55 million.						
Efficiency Measure	APG 5AT28	This Theme will complete 90% of the major milestones planned for FY 2005.	Red	The Aviation Safety and Security Program was able to meet all its FY 2005 objectives by deferring the start of the aviation security technology developments that would support out-year goals. However, the magnitude of the change was significantly higher for both the Aviation Systems and Vehicle Systems Programs. As a result of canceled procurements, NASA only accomplished about 60% of the originally planned milestones in these two programs.	The funding of Congressional Special Interest items required approximately 1/3 of the funding planned for acquisitions associated with the accomplishment of program/project milestones. As a result, NASA did not accomplish the planned activities.	Not applicable.
FY 2006 Follow-up						
ARMD successfully completed all the major FY 2005 milestones that were not canceled.						
Efficiency Measure	APG 5SSE15	Complete all development projects within 110% of the cost and schedule baseline	Yellow	The Deep Impact mission was not launched within 110% of its cost and schedule baselines.	Deep Impact did not meet its original launch readiness date of January 2004, and exceeded the cost baseline by 26%. Performance problems with the new, state-of-the-art spacecraft computers delayed their delivery for integration and test, which drove further delays to the spacecraft integration and test schedule, slipping the spacecraft delivery beyond the original launch date.	Deep Impact was successfully launched on January 12, 2005.
FY 2006 Follow-up						
As stated in the FY 2005 Performance Improvement Plan, Deep Impact successfully launched on January 12, 2005.						

Objective	Performance Measure	Description	Rating	Explanation/ description of where a performance goal was not met	Why the goal was not met	Plans and schedules for achieving the goal
Efficiency Measure	APG 5ASO14	Deliver at least 90% of scheduled operating hours for all operations and research facilities.	Yellow	The FUSE mission did not meet the 90% threshold for operating hours. (All other Theme missions met the threshold.)	On December 26, 2004, the z-axis reaction wheel assembly failed. This was the third of four assemblies to fail on the mission.	The project started a recovery effort immediately to recover control of the spacecraft. Because the spacecraft was designed to use a minimum of 2 reaction wheel assemblies, an entire motion control software had to be developed and tested, with final on-orbit tests in late June 2005. Science observations resumed on July 10, 2005.
FY 2006 Follow-up						
As stated in the FY 2005 Performance Improvement Plan Science, observations resumed on July 10, 2005.						
Efficiency Measure	APG 5SEC14	Complete all development projects within 110% of the cost and schedule baseline.	Red	The Cloudsat and CALIPSO missions were not completed within 110% of their cost and schedule baselines.	The CALIPSO and CloudSat missions are currently estimated to exceed baseline cost by more than 30% and schedule baselines by approximately 50%. The delays and associated costs resulted from a number of factors, including instrument problems on both missions. Delays have also resulted from external factors, such as co-manifest complexities, international partner deliveries, and significant launch vehicle-driven delays.	Cloudsat and CALIPSO are scheduled for launch in early FY 2006.
FY 2006 Follow-up						
CALIPSO and CloudSat launched from Vandenberg Air Force Base on April 28 2006.						
Efficiency Measure	APG 5SEC15	Deliver at least 90% of scheduled operating hours for all operations and research facilities.	Yellow	The TOPEX/Poseidon mission did not meet the 90% threshold for operating hours. (The other Earth–Sun missions met the threshold, with the majority experiencing no loss at all.)	TOPEX does not have a working tape recorder, creating a limiting factor for TOPEX science. NASA expected the three recorders to fail after a decade of service on orbit. Despite this, TOPEX continues to provide vital science even though some subsystems no longer are available.	The most important aspect of science collections has to do with measurement of long-term variations of ocean surface topology. Intermittent interruptions, while undesirable, do not impact major science goals. NASA is compensating through real-time downlinking via the TDRSS communication satellite, where possible.
FY 2006 Follow-up						
The TOPEX spacecraft experienced a mission ending failure in October 2005, during its 13th year of operation, when a second (out of four) momentum control wheel failed. An earlier failure had left the spacecraft with no backup capability. JPL worked on the problem for several weeks trying to regain operability of the wheel without success. NASA issued instructions to terminate the mission, and JPL completed decommissioning operations in January 2006.						

Appendix C: OMB Program Assessment Rating Tool (PART) Recommendations

The Program Assessment Rating Tool (PART) is an evaluation tool developed by the White House Office of Management and Budget (OMB) to assess the effectiveness of federal programs. PART provides a rigorous and interactive method to assess program planning, management, and performance toward quantitative, outcome-oriented goals. NASA submits one-third of the Agency's program portfolios (known as Themes) to OMB each year, resulting in a complete Agency assessment every three years.

Since FY 2002, NASA and OMB have been conducting PART reviews of the Agency's programs. In FY 2006, OMB reviewed two new Agency Themes, Constellation Systems and Advanced Business Systems, and reassessed the Solar System Exploration Theme. The improvement plan and follow-up actions for these assessments will be finalized later this year.

NASA managers use the PART findings to support future decisions for program structure and planning, and NASA tracks these findings, summarized in the table below, as actions throughout NASA's strategy, budget, and performance planning cycles.

NASA and OMB continue to work together to assure that performance measures reflected in PART are consistent with the performance measures included in the Agency's annual performance plan and annual Performance and Accountability Report.

Stategic Goal 1		
Program (Theme)	Calendar Year Reviewed	Rating
Space Shuttle	2005	Adequate
Program Performance Improvement Plan		**Follow-up**
• Plan to retire the Shuttle by the end of the decade, when its role in assembling the International Space Station is complete.		• Completed
• Return the Shuttle safely to flight and continue using it to support the Space Station.		• Action taken, but not completed
• Develop outcome-oriented short and long-term measures for the Space Shuttle Program.		• Completed
• Develop outcome-oriented measures to assess the effectiveness of the transition between the Space Shuttle and exploration programs.		• Action taken, but not completed
• Improve NASA's financial management system to eliminate the Agency's four ongoing material weaknesses and to comply with the *Federal Financial Management Improvement Act of 1996.*		• Action taken, but not completed

Strategic Goal 2		
Program (Theme)	Calendar Year Reviewed	Rating
International Space Station	2004	Moderately Effective
Program Performance Improvement Plan		Follow-up
• Develop alternatives to the Space Shuttle for resupplying the International Space Station.		• Action taken, but not completed
• Hold program managers accountable for cost, schedule and performance results, and demonstrate that the program is achieving its annual performance goals.		• Action taken, but not completed
Strategic Goal 3A / 3B		
Program (Theme)	Calendar Year Reviewed	Rating
Earth-Sun System	2005	Moderately Effective
Program Performance Improvement Plan		Follow-up
• Report for major missions on the following: estimated mission life cycle cost upon entering development; key schedule milestones associated with each mission phase for those missions formally approved for formulation; mission cost and schedule progress achieved in each phase before entering the next; and any plans to re-baseline life-cycle cost and schedule.		• Action taken, but not completed
• Assess the obstacles to improving the hand-off of NASA's research and development to other federal agencies and implement to the extent possible organizational and system fixes to ensure results.		• Completed
• Assure that the priorities developed in the National Research Council's forthcoming Earth science decadal survey are reflected to the extent feasible in the program's portfolio.		• Action taken, but not completed
Strategic Goal 3C		
Program (Theme)	Calendar Year Reviewed	Rating
Solar System Exploration	2006	Effective
Program Performance Improvement Plan		Follow-up
• To Be Determined		• Not Applicable
Strategic Goal 3D		
Program (Theme)	Calendar Year Reviewed	Rating
Astronomy and Astrophysics Research	2004	Effective
Program Performance Improvement Plan		Follow-up
• Report for major missions on the following: estimated mission life cycle cost upon entering development; key schedule milestones associated with each mission phase for those missions formally approved for formulation; mission cost and schedule progress achieved in each phase before entering the next; and any plans to re-baseline life-cycle cost and schedule.		• Action taken, but not completed
Strategic Goal 3E		
Program (Theme)	Calendar Year Reviewed	Rating
Aeronautics Technology	2004	Moderately Effective
Program Performance Improvement Plan		Follow-up
• Continue performing regular program reviews to ensure funding of projects that are relevant and effective.		• Completed
• Strengthen priority research areas identified by NASA, in consult with the NRC and external partners.		• Completed
• Restructure the program to better focus on projects that have a federal role.		• Completed
• Develop technical metrics and demonstrate quantitative progress against those metrics.		• Completed
• Define new Aeronautics Performance Measures applicable to the refocused FY 2006 Aeronautics Program.		• Action taken, but not completed
• Preserve the Wind Tunnel infrastructure at the Research Centers which are deemed either mission-critical and/or a unique national asset.		• Completed

Strategic Goal 3F		
Program (Theme)	Calendar Year Reviewed	Rating
Human Systems Research and Technology	2005	Adequate
Program Performance Improvement Plan		**Follow-up**
• Establish a risk mitigation process for the Bioastronautics Roadmap deliverables for Human Space Exploration. Develop a critical path analyses for each deliverable including schedule and resource requirements.		• Action taken, but not completed
• Develop measures to ensure directed research is fully peer reviewed using the Non-Advocate Review Process.		• Action taken, but not completed
• Streamline the NASA Research Announcement to reduce time between solicitation and selection. Develop metrics to analyze progress.		• Action taken, but not completed
Strategic Goal 4		
Program (Theme)	Calendar Year Reviewed	Rating
Constellation Systems	2006	Adequate
Program Performance Improvement Plan		**Follow-up**
• To Be Determined		• Not Applicable
Cross Agency Support Program		
Program (Theme)	Calendar Year Reviewed	Rating
Education Program	2004	Adequate
Program Performance Improvement Plan		**Follow-up**
• Continue to perform regular program reviews to assure that only effective, relevant programs are funded.		• Completed
• Require all programs to report annually on accomplishments and make these data available to the public.		• Action taken, but not completed
• Require programs to perform self-evaluations including, as appropriate, solicitations of student feedback and collections of longitudinal data on student career paths.		• Action taken, but not completed
• Fill the Agency's workforce needs by making a stronger effort to consider eligible Education program participants for and facilitate their entry into jobs at NASA.		• Action taken, but not completed
• Develop appropriate performance measures, baselines, and targets.		• Action taken, but not completed
• Develop a new education investment framework, with ensuing implementation plan, in support of the Agency's strategic direction and the Vision for Space Exploration.		• Action taken, but not completed
Cross Agency Support Program		
Program (Theme)	Calendar Year Reviewed	Rating
Advanced Business Systems	2006	Moderately Effective
Program Performance Improvement Plan		**Follow-up**
• To Be Determined		• Not Applicable
Multiple Goals		
Program (Theme)	Calendar Year Reviewed	Rating
Space and Flight Support	2004	Adequate
Program Performance Improvement Plan		**Follow-up**
• Continue to fund the program at an essentially flat level, but strive to improve the program's results by increasing efficiency.		• Action taken, but not completed
• Develop a plan to independently review all of the major program elements to support improvements and evaluate effectiveness and relevance.		• Completed
• Develop better measures that will help to drive program improvement.		• Action taken, but not completed
• Remove Environmental Remediation from the Space and Flight Support portfolio and make it a part of NASA's corporate general and administrative costs.		• Completed

Appendix D: Source Information

Sources for NASA Performance Ratings

The following table provides information on the source of each Annual Performance Goals rating (Red, Yellow, Green, White). The sources are usually in the form of a link to a Web site that has supporting data available, a citiation to a journal or other published reference that supports the rating, or a point of contact at NASA who can provide information on how the rating was determined. The links provided were functional as of November 1, 2006.

APG Number	Source for NASA FY 2006 Performance Rating
Strategic Goal 1	
Outcome 1.1	
6SSP1	Bill Hill, Assistant Associate Administrator for Space Shuttle, Office of Safety and Mission (OSMA). 1) Assurance Open Investigations Being Tracked by HQ OSMA.
Strategic Goal 2	
Outcome 2.1	
6ISS1	Benjamin Jimenea, Space Operations Mission Directorate, International Space Station.
6ISS3	Benjamin Jimenea, Space Operations Mission Directorate, International Space Station.
6ISS4	Benjamin Jimenea, Space Operations Mission Directorate, International Space Station.
Strategic Goal 3A	
Outcome 3A.1	
6ESS1	Martha Maiden, Earth Science Program Executive, Science Mission Directorate.
6ESS20	Jack Kaye, Earth Science Associate Director for Research, Science Mission Directorate.
6ESS3	Lou Schuster, Earth Science Program Executive, Science Mission Directorate.
6ESS4	Amy Walton, Earth Science Technology Program Manager, Science Mission Directorate.
6ESS5	Martha Maiden, Earth Science Program Executive, Science Mission Directorate.
6ESS6	Martha Maiden, Earth Science Program Executive, Science Mission Directorate.
6ESS7	Jack Kaye, Earth Science Associate Director for Research, Science Mission Directorate.
Outcome 3A.4	
6ESS22	Budget of the United States Government Fiscal Year 2007, available at http://www.whitehouse.gov/omb/budget/
Outcome 3A.5	
6ESS23	Jennifer Kearns, Science Mission Directorate Program Analyst.
Outcome 3A.7	
6ESS21	Applications Implementation Working Group (AIWG) at Goddard Space Flight Center http://aiwg.gsfc.nasa.gov

APG Number	Source for NASA FY 2006 Performance Rating
Strategic Goal 3B	
Outcome 3B.1	
6ESS11	Barbara Giles, Heliophysics Discipline Scientist, Science Mission Directorate. 1) N. Schwadron, D. McComas, C. DeForest. 2006. Relationship between Solar Wind and Coronal Heating: Scaling Laws from Solar X-Rays. The Astrophysical Journal, Volume 642, Issue 2. 2) S. Lefebvre and A. Kosovichev. 2005. Changes in the Subsurface Stratification of the Sun with the 11-Year Activity Cycle. The Astrophysical Journal. Volume 633. Part 2.
6ESS12	Barbara Giles, Heliophysics Discipline Scientist, Science Mission Directorate. 1) D. McComas, H. Elliott, J. Gosling, R. Skoug. 2006. Ulysses observations of very different heliospheric structure during the declining phase of solar activity cycle 23. Geophysical Research Letters. Volume 33. 2) K. Than. 2006. Voyager 2 Detects Odd Shape of Solar System's Edge. http://www.space.com/scienceastronomy/060523_heliosphere_shape.html
6ESS14	Barbara Giles, Heliophysics Discipline Scientist, Science Mission Directorate. 1) G. Hurford, S. Krucker, R. Lin, R. Schwartz, G. Share, D. Smith. 2006. The Astrophysical Journal, Volume 644. 2) F. Cattaneo, N. Brummell, K. Cline. 2006. What is a flux tube? On the magnetic field topology of buoyant flux structures. Monthly Notices of the Royal Astronomical Society. Volume 365. 3) C. Chaston, V. Genot, J. Bonnell, C. Carlson, J. McFadden, R. Ergun, et. al. 2006. Ionospheric erosion by Alfvén waves. Journal of Geophysical Research. Volume 111.
6ESS15	Barbara Giles, Heliophysics Discipline Scientist, Science Mission Directorate. 1) T. Phan, J. Gosling, M. Davis, R. Skoug, M. Oieroset, R. Lin, et. al. 2006. A magnetic reconnection X-line extending more than 390 Earth radii in the solar wind. Nature. Volume 439. 2) K. Trattner, et al. 2006. ESA. Cambridge University Press, SP-598 (K. Trattner, et al., submitted to Journal Geophysical Research. 3) D. Wendel, P. Reiff, A. Fazakerley, E. Lucek, M. Goldstein. 2006. Magnetic Structure and Electron Flow at a Northward Interplanetary Magnetic Field Reconnection Line. Geophysical Research Letters.
6ESS17	Jennifer Kearns, Science Mission Directorate Program Analyst.
6ESS18	Jennifer Kearns, Science Mission Directorate Program Analyst. 1) D. Brown, E. Hupp. 2006. NASA Selects Teams for Space Weather Mission and Studies. NASA Press Release 06-286.
Outcome 3B.2	
6ESS10	Barbara Giles, Heliophysics Discipline Scientist, Science Mission Directorate. 1) S. Petelina, D. Degenstein, E. Llewellyn, N. Lloyd, C. Mertens, M. Mlynczak, J. Russell III. 2005. Thermal conditions for PMC existence derived from Odin/OSIRIS and TIMED/SABER data. Geophysical Research Letters. Volume 32. 2) Kozyra et al., in Recurrent Magnetic Storms: Corotating Solar Wind Streams, AGU Geosciences Monograph, in press 2006.
6ESS13	1) Geophysical Research Letters. 2006. GL026161R. 2) H. Xie, N. Gopalswamy, P. Manoharan, A. Lara, S. Yashiro, S. Lepri. 2006. Long-lived geomagnetic storms and coronal mass ejections. Journal of Geophysical Research. Volume 111. 3) Demars, Schunk. 2006. Thermospheric Response to ion heating in the dayside cusp. Journal of Atmospheric and Solar-Terrestrial Physics. 4) L. Gardner, R. Schunk. 2006. Ion and neutral polar winds for northward interplanetary magnetic field conditions, Journal of Atmospheric and Solar-Terrestrial Physics. Volume 68. 5) M. Denton, J. Borovsky, R. Skoug, M. Thomsen, B. Lavraud, M. Henderson, R. McPherron, J. Zhang, M. Liemohn. 2006. Geomagnetic storms driven by ICME- and CIR-dominated solar wind. Journal of Geophysical Research.Volume 111. 6) J. Borovsky, M. Denton. 2006. Differences between CME-driven storms and CIR-driven storms. Journal of Geophysical Research. Volume 111.
6ESS16	Jennifer Kearns, Science Mission Directorate Program Analyst.
6ESS19	Solar Sentinels: Report of the Science and Technology Definition Team. http://sentinels.gsfc.nasa.gov
6ESS8	Barbara Giles, Heliophysics Discipline Scientist, Science Mission Directorate. 1) D. Brown, E. Hupp, B. Steigerwald, N. Neal-Jones. 2006. NASA Aids in Resolving Long Standing Solar Cycle Mystery. NASA Press Release 06-087. http://www.nasa.gov/home/hqnews/2006/mar/HQ_06087_solar_cycle.html 2) M. Dikpati, G. De Toma, P.A. Gilman. 2006. Predicting the strength of solar cycle 24 using a flux-transport dynamo-based tool. Geophysical Research Letters. Paper 33. 3) I. Gonzalez-Hernandez, D.C. Braun, S.M. Handsome, F. Hill, C.A. Lindsey, P.H. Scherrer. 2006. Farside Helioseismic Holography: Recent Advances. American Astronomical Society. SPD meeting 37:5.

APG Number	Source for NASA FY 2006 Performance Rating
6ESS9	Barbara Giles, Heliophysics Discipline Scientist, Science Mission Directorate. 1) X. Li, D. Baker, T. O'Brien, L. Xie, Q. Zong. 2006. Correlation between the inner edge of outer radiation belt electrons and the innermost plasmapause location. Geophysical Research Letters. Volume 33.
Strategic Goal 3C	
Outcome 3C.1	
6SSE10	Phil Crane, Planetary Discipline Scientist, Science Mission Directorate. 1) Canup, Ward. 2006. A common mass scaling for satellite systems of gaseous planets. Nature. http://www.gps.caltech.edu/7Embrown/planetlila/index.html
6SSE11	Phil Crane, Planetary Discipline Scientist, Science Mission Directorate. 1) T. Cravens, I. Robertson, J. Waite Jr., R. Yelle, W. Kasprzak, C. Keller. 2006. Composition of Titan's ionosphere. Geophysical Research Letters. Volume 33. 2) M. Trainer, A. Pavlov, H. DeWitt, J. Jimenez, C. McKay, O. Toon, M. Tolbert. (Prepraration for submission 2006). Organic Haze on Titan and the Early Earth. Meteoritics and Planetary Science. Volume 41. 3) D. Glavin, J. Dworkin. 2006. Investigation of isovaline enantiomeric excesses in CM meteorites using liquid chromotography–time of flight–mass spectrometery. Astrobiology. Volume 6. 4) M. Klussmann, et al. 2006. Thermodynamic control of asymmetric amplification in amino acid crystals. Nature. Volume 441. 5) H. Busemann, et al. 2006. Interstellar chemistry recorded in organic matter from primitive meteorites. Science. Volume 312. 6) D. Glavin, et al. 2006. Amino acid analyses of Antarctic CM2 meteorites using liquid chromotography–time of flight–mass spectrometery. Meteoritics and Planetary Science. Volume 41.
6SSE26	E. Hupp, M. Fellows, W. Jeffs. 2006. NASA's Stardust Findings May Alter View of Comet Formation. NASA Press Release 06-091. http://stardust.jpl.nasa.gov/news/status/060313.html
6SSE27	Jennifer Kearns, Science Mission Directorate Program Analyst.
6SSE28	Jennifer Kearns, Science Mission Directorate Program Analyst.
6SSE7	Phil Crane, Planetary Discipline Scientist, Science Mission Directorate. 1) Canup, Ward. 2006. A common mass scaling for satellite systems of gaseous planets, Nature. Volume 15. 2) Raymond et al. 2006. Icarus.183-265.
6SSE8	Phil Crane, Planetary Discipline Scientist, Science Mission Directorate. 1) E. Hupp, M. Fellows, W. Jeffs. 2006. NASA's Stardust Findings May Alter View of Comet Formation. NASA Press Release 06-091. http://stardust.jpl.nasa.gov/news/status/060313.html
Outcome 3C.2	
6SSE12	Phil Crane, Planetary Discipline Scientist and Michael Meyer, Mars Exploration Program Lead Scientist (Science Mission Directorate).
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6SSE16	Phil Crane, Planetary Discipline Scientist and Michael Meyer, Mars Exploration Program Lead Scientist (Science Mission Directorate). 1) R. Arvidson, et al. 2006. Overview of the Spirit Mars Exploration Rover Mission to Gusev Crater: Landing site to Backstay Rock in the Columbia Hills. Journal of Geophysical Research. Volume 111. 2) N. Cabrol, et al. 2006. Aqueous processes at Gusev crater inferred from physical properties of rocks and soils along the Spirit traverse. Journal of Geophysical Research. Volume 111. 3) D.W. Ming, et al. 2006. Geochemical and mineralogical indicators for aqueous processes in the Columbia Hills of Gusev crater, Mars Journal of Geophysical Research. Volume 111. 4) S. Squyres, et al. 2006. Two Years Before the Mast: Continuing Observations by the Opportunity Rover at Meridiani Planum, Mars. Science.
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6SSE19	Phil Crane, Planetary Discipline Scientist and Michael Meyer, Mars Exploration Program Lead Scientist (Science Mission Directorate).
6SSE25	Jennifer Kearns, Science Mission Directorate Program Analyst.
6SSE9	Phil Crane, Planetary Discipline Scientist and Michael Meyer, Mars Exploration Program Lead Scientist (Science Mission Directorate).
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6SSE20	Michael Meyer, Mars Exploration Program Lead Scientist, Science Mission Directorate. 1) R Arvidson, et al. 2006. Overview of the Spirit Mars Exploration Rover Mission to Gusev Crater: Landing site to Backstay Rock in the Columbia Hills. Journal of Geophysical Research. Volume 111.
Outcome 3C.4	
6SSE21	Michael Meyer, Mars Exploration Program Lead Scientist, Science Mission Directorate.
6SSE22	Michael Meyer, Mars Exploration Program Lead Scientist, Science Mission Directorate.
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6SSE5	Michael Meyer, Mars Exploration Program Lead Scientist, Science Mission Directorate.
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6UNIV13	Eric Smith, Astrophysics Discipline Scientist, Science Mission Directorate. 1) E. Hupp, G. Hautaluoma. 2006. NASA's Chandra Finds Black Holes Are 'Green'. NASA Press Release 06-192. http://www.nasa.gov/home/hqnews/2006/apr/HQ_06192_Green_black_holes.html 2) E. Thompson. 2006. Scientists find Black Hole's Point of no Return. http://universe.nasa.gov/press/2006/060109b.html 3) G. Deutsch, E. Hupp, S. Roy, M. Watzke. 2006. NASA's Chandra Finds Black Holes Stirring Up Galaxies. NASA Press Release 06-006. http://www.nasa.gov/home/hqnews/2006/jan/HQ_06006_Chandra_AAS_update.html
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6UNIV20	Jennifer Kearns, Science Mission Directorate Program Analyst.
6UNIV8	Eric Smith, Astrophysics Discipline Scientist, Science Mission Directorate. 1) G. Hautaluoma, S. Hendrix. 2006. NASA Satellite Glimpses Universe's First Trillionth of a Second. NASA Press Release 06-097. http://www.nasa.gov/home/hqnews/2006/mar/HQ_06097_first_trillionth_WMAP.html
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6UNIV2	Eric Smith, Astrophysics Discipline Scientist, Science Mission Directorate. 1) G. Hautaluoma, S. Hendrix. 2006. NASA's Fuse Finds Infant Solar System Awash in Carbon. NASA Press Release 06-236. http://www.nasa.gov/home/hqnews/2006/jun/HQ_06236_FUSE_0607_final.html

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6UNIV21	Jennifer Kearns, Science Mission Directorate Program Analyst.
6UNIV3	Eric Smith, Astrophysics Discipline Scientist, Science Mission Directorate. 1) P. Kalas. 2006. Dusty Planetary Disks Around Two Nearby Stars Resemble Our Kuiper Belt. http://hubblesite.org/newscenter/newsdesk/archive/releases/2006/05/
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6AT7	Guy Kemmerly, Langley Research Center, Small Aircraft Transport Systems. 1) www.ncam-sats.org The Small Aircraft Transportation System Project: An Update. 2006. The Journal of Air Traffic Control, ATCA. 2) Website: www.ncam-sats.org

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Outcome 3E.3	
6AT11	Vicki Crisp, Office of Program and Institutional Integration, Technology Integration Manager.
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6AT19	1) Aeronautics Research Mission Directorate. NASA Reseach Announcement. 8-1-06. http://aero.hq.nasa.gov/nra.htm 2) NASA ARMD Research Opportunities in Aeronautics NRA. 2006. http://prod.nais.nasa.gov/cgi-bin/eps/synopsis.cgi?acqid=119999
6AT8	Vicki Crisp, Office of Program and Institutional Integration, Technology Integration Manager.
Strategic Goal 3F	
Outcome 3F.1	
6HSRT10	Angee Lee, Exploration Systems Mission Directorate, Assistant Program Management.
6HSRT11	Angee Lee, Exploration Systems Mission Directorate, Assistant Program Management.
6HSRT20	Angee Lee, Exploration Systems Mission Directorate, Assistant Program Managementt.
6HSRT9	Angee Lee, Exploration Systems Mission Directorate, Assistant Program Management.
6SFS5	Dr. John Allen, Crew Health and Safety, Program Executive.
6SFS6	Dr. John Allen, Crew Health and Safety, Program Executive.
Outcome 3F.2	
6HSRT13	Monserrate Roman, Marshall Space Flight Center. 1) Marshall Space Flight Center Exploration Life Support Bi-Weekly Report (June 24, 2006 - July 21, 2006) distributed August 8, 2006. https://ice.exploration.nasa.gov/Wind-chill/
6HSRT14	Dr. Fred Kohl, Glenn Research Center Phycisist.
6HSRT15	Dr. Fred Kohl, Glenn Research Center Phycisist.
6HSRT16	Dr. Fred Kohl, Glenn Research Center Phycisist.
6HSRT17	John Fisher, Ames Research Center. 1) G. Pace, J. Fisher. 2006. Compaction Technologies for Near and Far Term Space Missions. SAE Aerospace Technical Paper No. 2006-01-2186.
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6HSRT19	James Knox, Marshall Space Flight Center. 1) J. Knox, M. Campbell, L. Miller, L. Mulloth, M. Varghese, B. Luna. 2006. Integrated Test and Evaluation of a 4-Bed Molecular Sieve, Temperature Swing Adsorption Compressor, and Sabatier Engineering Development Unit. SAE Aerospace Technical Paper No. 2006-01-2271. 2) L. Mulloth, M. Rosen, M. Varghese, J. Knox, B. Luna, B. Webbon. 2006. Performance Characterization of a Temperature-Swing Adsorption Compressor for Closed-Loop Air Revitalization Based on Integrated Tests with Carbon Dioxide Removal and Reduction Assemblies. SAE Aerospace Technical Paper No. 2006-01-2126. 3) F. Jeng, M. Campbell, S. Lu, F. Smith and J. Knox. 2006. Modeling and Analyses of an Integrated Air Revitalization System of a 4-Bed Molecular Sieve Carbon Dioxide Removal System (CDRA), Mechanical Compressor Engineering Development Unit (EDU) and Sabatier Engineering Development Unit. SAE Aerospace Technical Paper No. 2006-01-2133.
Outcome 3F.3	
6HSRT3	Darrell Jan, Jet Proplusion Laboratory, Advanced Environmental Monitoring and Control Office, Program Manager.
6HSRT4	Darrell Jan, Jet Proplusion Laboratory, Advanced Environmental Monitoring and Control Office, Program Manager. 1) Jet Propulsion Laboratory Home Page. http://aemc.jpl.nasa.gov
6HSRT5	Dr. Fred Kohl, Glenn Research Center Phycisist.
6HSRT6	Dr. Fred Kohl, Glenn Research Center Phycisist.
6HSRT7	Dr. Fred Kohl, Glenn Research Center Phycisist.
6HSRT8	Dr. Fred Kohl, Glenn Research Center Phycisist.

APG Number	Source for NASA FY 2006 Performance Rating
Strategic Goal 4	
Outcome 4.1	
6CS1	Constellation Program System Requirements Review (SRR) Process Plan, Document Cx70006, March 28, 2006.
6CS2	Christina Guidi, Exploration Systems Mission Directorate Program Executive, Launch Vehicles.
6CS3	1) Constellation Human Rating Plan, Document CxP70067. 2) Constellation Program Systems Engineering Management Plan, Document CxP70013, Sept 8, 2006. 3) Exploration Launch projects Plan, Document CxP70057, September 11, 2006. 4) Systems Requirements Document for Crew Launch Vehicle, Document CxP72034, October 6, 2006
6CS4	Christina Guidi, Exploration Systems Mission Directorate Program Executive, Launch Vehicles. 1) System Engineering Management Plan (SEMP)
Outcome 4.2	
6HSRT1	David Jarrett, Constellation Systems Division Program Executive.
6HSRT2	David Jarrett, Constellation Systems Division Program Executive.
Strategic Goal 5	
Outcome 5.1	
6SFS4	Marc Timm, Exploration Systems Mission Directorate Special Assistant to the Director.
Outcome 5.2	
6ISS2	K. Nolan. 2006. Commercial Orbital Transportation Services Demonstration. http://procurement.jsc.nasa.gov/cots/
Strategic Goal 6	
Outcome 6.1	
6SSE1	Victoria Friedensen, Exploration Systems Mission Directorate Program Executive.
Outcome 6.2	
6ESRT1	Victoria Friedensen, Exploration Systems Mission Directorate Program Executive. 1) In-Space Cryogenic Propellant Depot project final report, May 2005.
6ESRT2	Victoria Friedensen, Exploration Systems Mission Directorate Program Executive.
6ESRT3	B. Haugerud, J. Comeau, A. Sutton, A. Prakash, J. Cressler, P. Marshall, et. al. 2006. Proton and Gamma Radiation Effects in a New First-Generation SiGe HBT Technology. Solid-States Electronics. Volume 50. Issue 2.
6ESRT4	NASA ISRU Project Overview, J. Sanders, International ISRU Conference, Cleveland, OH, August 15, 2006.
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6ESRT6	Victoria Friedensen, Exploration Systems Mission Directorate, Program Executive. 1) ESAS Final Report, Nov. 2005.
6ESRT7	Victoria Friedensen, Exploration Systems Mission Directorate, Program Executive. 1) ESAS Final Report, Nov. 2005.
6ESRT8	http://www-robotics.jpl.nasa.gov/tasks/index.cfm. See ATHLETE task under Exploration Systems Mission Directorate funded.
Outcome 6.3	
6PROM1	Victoria Friedensen, Exploration Systems Mission Directorate Program Executive. 1) ESAS Final Report, Nov. 2005.
6PROM2	Victoria Friedensen, Exploration Systems Mission Directorate Program Executive. 1) ESAS Final Report, Nov. 2005.
6PROM3	Victoria Friedensen, Exploration Systems Mission Directorate Program Executive. 1) ESAS Final Report, Nov. 2005.

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Outcome 6.4	
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6SFS3	Cherish Johnson, Space Communications Office, Space Operations Mission Directoate. 1) GSFC Monthly Status Reviews. 2) GSFC monthly program report to HQ Program Executive. 3) Monthly Program Status Reviews at NASA HQ by Program Management.
Cross Agency Outcomes	
Outcome ED-1	
6ED3	PAR Reports. https://neeis.gsfc.nasa.gov/par_report_2006_v3.html
6ED4	PAR Reports. https://neeis.gsfc.nasa.gov/par_report_2006_v3.html
6ED5	PAR Reports. https://neeis.gsfc.nasa.gov/par_report_2006_v3.html
6ED6	PAR Reports. https://neeis.gsfc.nasa.gov/par_report_2006_v3.html
6ED7	PAR Reports. https://neeis.gsfc.nasa.gov/par_report_2006_v3.html
Outcome IEM-2	
6IEM1	Integrated Asset Management Business Case Analysis. www.iemp.nasa.gov
Outcome IPP-1	
6ESRT10	Jack Yadvish, Deputy Director Innovative Partnerships Program. 1) Quarterly Reports provided by IPP Field Center offices.
6ESRT11	Jack Yadvish, Deputy Director Innovative Partnerships Program. 1) Quarterly Reports provided by IPP Field Center offices.
6ESRT12	Jack Yadvish, Deputy Director Innovative Partnerships Program. 1) NASA SBIR program office statistics and Quarterly Reports provided by IPP Field Center offices.
6ESRT9	Jack Yadvish, Deputy Director Innovative Partnerships Program. 1) Quarterly Reports provided by IPP Field Center offices.

APG Number	Source for NASA FY 2006 Performance Rating
Efficiency Measures	
6AT12	Tom Irvine, Director, Mission Support Division.
6AT13	Jay Dryer Aeronautics Research Mission Directorate, Senior Technical Advisor.
6CS5	Christina Guidi, Exploration Systems Mission Directorate Program Executive, Launch Vehicles.
6CS6	Christina Guidi, Exploration Systems Mission Directorate Program Executive, Launch Vehicles.
6ESS24	Jane Green, Business Management Division, Program Analyst.
6ESS25	Lou Schuster, Earth Science Program Executive.
6ESS26	Jennifer Kearns, Science Mission Directorate Program Analyst.
6ESS27	Jennifer Kearns, Science Mission Directorate Program Analyst.
6ED11	PAR Reports. https://neeis.gsfc.nasa.gov/par_report_2006_v3.html
6ED12	NASA FY 06 budget appropriation, HR 109-272.
6ESRT13	Victoria Friedensen, Exploration Systems Mission Directorate Program Executive.
6ESRT14	Victoria Friedensen, Exploration Systems Mission Directorate Program Executive.
6ESRT15	Victoria Friedensen, Exploration Systems Mission Directorate Program Executive.
6PROM4	Victoria Friedensen, Exploration Systems Mission Directorate Program Executive.
6PROM5	Victoria Friedensen, Exploration Systems Mission Directorate Program Executive.
6HSRT21	Angee Lee, Exploration Systems Mission Directorate, Assistant Program Management.
6HSRT22	Angee Lee, Exploration Systems Mission Directorate, Assistant Program Management.
6HSRT23	Angee Lee, Exploration Systems Mission Directorate, Assistant Program Management.
6HSRT247	Angee Lee, Exploration Systems Mission Directorate, Assistant Program Managementt.
6ISS5	Benjamin Jimenea, Space Operations Mission Directorate, International Space Station. 1) Budget of the United States Government Fiscal Year 2007. Available at http://www.whitehouse.gov/omb/budget/
6ISS6	Benjamin Jimenea, Space Operations Mission Directorate, International Space Station. 1) Space Shuttle Program Flight Assignment Working Group Planning Manifest 06B-21. 2) International Space Station Utilization and Logistics Flight 1.1 Mission Integration Plan, June 22, 2006. 3) International Space Station 12A Mission Integration Plan, 8/4/06.
6SSE29	Voleak Roeum, Business Management Division, Program Analyst.
6SSE30	Jennifer Kearns, Science Mission Directorate Program Analyst.
6SSE31	Jennifer Kearns, Science Mission Directorate Program Analyst.
6SSE32	Dr. Paul Hertz, Science Mission Directorate, Chief Scientist.
6SFS2	Ann Sweet, Space Operations Mission Directorate, Launch Services. 1) NASA ELV Launch History as of June 2006.
6SFS7	Ann Sweet, Space Operations Mission Directorate, Launch Services.
6SFS8	Ann Sweet, Space Operations Mission Directorate, Launch Services.
6SSP2	Bill Hill, Assistant Associate Administrator for Space Shuttle, Office of Safety and Mission (OSMA).
6SSP3	Bill Hill, Assistant Associate Administrator for Space Shuttle, Office of Safety and Mission (OSMA). 1) Space Shuttle Program Flight Assignment Working Group Planning Manifest 06B-21. 2) ISS Utilization and Logistics Flight 1.1 Mission Integration Plan, June 22, 2006. 3) ISS-12A Mission Integration Plan, Aug. 4, 2006.
6UNIV22	Jennifer Kearns, Science Mission Directorate Program Analyst.
6UNIV23	Jennifer Kearns, Science Mission Directorate Program Analyst.
6UNIV24	Jennifer Kearns, Science Mission Directorate Program Analyst.
6UNIV25	Dr. Paul Hertz, Science Mission Direcorate, Chief Scientist.

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Back cover: Lights of vehicles and service structures pierce the fog as Space Shuttle *Atlantis* approaches Launch Pad 39B on August 2, 2006. *Atlantis* launched on September 9, beginning mission STS-115 to International Space Station (ISS). During the mission, the six Shuttle crewmembers delivered cargo and continued ISS construction. (NASA)

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NP-2006-11-451-HQ

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