National Aeronautics and Space Administration

FY 2008 Performance & Accountability Report

NASA's Performance and Accountability Report

This is the National Aeronautics and Space Administration's (NASA) Fiscal Year 2008 (FY 2008) Performance and Accountability Report (PAR). 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 PAR includes detailed performance information and financial statements, as well as NASA's management challenges and NASA's plans and efforts to overcome them. This is a report to the American people on NASA's progress toward its Strategic Goals.

NASA's FY 2008 PAR 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).

For FY 2008, NASA has produced a consolidated PAR, which is organized as follows:

Part 1—Management Discussion and 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 2008 Performance Plan Update included in NASA's FY 2009 Budget Estimates. 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 2008.

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.

Part 4—Other Accompanying Information. Part 4 includes the Inspector General's statement on NASA's management and performance challenges, the status of the Agency's follow-up actions on Inspector General audits, an Improper Payments Information Act (IPIA) Assessment, a summary of financial statement audit and management assurances, an FY 2007 Performance Improvement Update, and a list of Office of Management and Budget Program Assessment Rating Tool (PART) recommendations for FY 2008.

If you have questions about NASA's PAR, please email hq-par@nasa.gov.

Message from the Administrator

November 14, 2008

I am pleased to present NASA's Performance and Accountability Report for FY 2008. NASA made significant progress this year in carrying out our mission of space exploration, scientific discovery, and aeronautics research and accomplishing the goals outlined in our Strategic Plan. The financial and performance information presented in this report highlights our efforts to manage taxpayer dollars responsibly and meet the high expectations of the American people, who have been inspired by our challenges and celebrated our successes for the past 50 years.

Consistent with our Strategic Goals, NASA's Space Shuttle Program continued an impressive string of International Space Station assembly missions in FY 2008, keeping NASA on schedule to complete ISS assembly by 2010.

NASA's work on exploration is progressing as well; we are transitioning Space Shuttle infrastructure and bringing the new Crew Exploration Vehicle into service. In addition, the Constellation Program has moved from program planning into development of the major program elements.

This year, we continued to use our vantage points in space to study the Earth and make progress in understanding the role of oceans, atmosphere, and ice in the climate system. We also looked outward and made exciting discoveries on Mars. Most notably, NASA's Phoenix Mars Lander identified water in a soil sample. In the aeronautics arena, NASA explored advanced concepts and technology critical to relieving air-traffic controller workload, which is the primary constraint on airspace capacity.

NASA accepts responsibility for accounting for our financial and performance data accurately, reliably, and with the same attention to detail as we devote to our scientific and technical research. With this in mind, I can provide reasonable assurance that the performance data in this report is complete and reliable. Any data limitations are documented explicitly.

We continue to make significant progress in the financial management arena. During FY 2008, the Agency developed and began to implement a comprehensive compliance strategy and continuous monitoring program for its financial reporting and accounting operations to better ensure the Agency's ability to prepare accurate and timely financial statements compliant with Federal accounting standards. In addition, the Agency implemented a new policy, system, and process for capturing and reporting the cost of capital assets, including those being acquired to support the Constellation Program. NASA also resolved a prior year material weakness in IT Security. And, NASA enhanced its financial and performance reporting systems, which are helping to drive improvements in the Agency's program and institutional financial performance. Notwithstanding this progress, due to continuing material weaknesses in financial systems, analyses, and oversight and asset management, I cannot provide reasonable assurance that this report's financial data is entirely complete and reliable. The Agency's efforts to address these weaknesses are discussed in the Statement of Assurance section of this report.

When NASA performs feats such as operating rovers on Mars and constructing the International Space Station we often forget the hard work and sleepless nights of thousands of engineers, scientists, and technicians that made these events possible. I can only chalk up such selflessness to an innate desire to be part of something greater than themselves, to be part of making history. This is one of the real reasons why I am proud to represent all NASA employees in presenting the 2008 Performance and Accountability Report.

Michael D. Griffin
Administrator

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50 Years of NASA

In 2008, NASA celebrated 50 years of pioneering the future of space exploration and aeronautics. Explorer 1, X-15, Mercury, Gemini, Apollo, Voyager, the Space Shuttle, the Hubble Space Telescope, the Mars Landers Spirit and Opportunity, and now Phoenix are all famous examples of the successes and achievements that the Agency has provided for the Nation.

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 conducted activities in space devoted to peaceful purposes for the benefit of humankind.

NASA arose from the pressures of national defense during the Cold War with the Soviet Union. What emerged through these turbulent times was a broad contest over the ideologies and allegiances of the nonaligned nations of the world. Space exploration became a viable arena in this contest. From the latter 1940s, the Department of Defense pursued research in rocketry and upper atmospheric sciences as a means of assuring American leadership in technology. A major step forward came when President Dwight D. Eisenhower approved a plan to orbit a scientific satellite as part of the International Geophysical Year, a cooperative effort to gather scientific data about Earth, for the period from July 1, 1957, to December 31, 1958. The Soviet Union quickly followed suit, announcing plans to orbit its own satellite.

Jet Propulsion Director William Pickering (left), scientist James Van Allen, and rocket pioneer Wernher von Braun triumphantly lift a model of Explorer 1 to announce the successful launch of America's first satellite on January 31, 1958. The mission, developed by the U.S. Army Ballistic Missile Agency, studied the radiation environment around Earth. (Credit: NASA)

A political crisis broke out on October 4, 1957, when the Soviets launched Sputnik 1, the world's first artificial satellite, beginning the "Space Race" (1957-1975) between the Soviet Union and the United States. NASA began operations on October 1, 1958, absorbing the earlier National Advisory Committee for Aeronautics, which included three major research laboratories: Langley Aeronautical Laboratory, Ames Aeronautical Laboratory, and Lewis Flight Propulsion Laboratory. NASA quickly incorporated other organizations into the new Agency, notably the space science group of the Naval Research Laboratory in Maryland, the Jet Propulsion Laboratory managed by the California Institute of Technology for the Army, and the Army Ballistic Missile Agency in Huntsville, Alabama. Eventually, NASA created other Centers; today, it has 10 located around the country, as well as NASA Headquarters in Washington, DC.

NASA began conducting space missions within months of its creation, and in its 50 years, has made historic achievements in many areas of aeronautics and space research. The Agency is most well known for human space flight efforts. NASA's human space flight efforts began with Projects Mercury and Gemini in the 1960s, reached a major highlight with the lunar landings of Project Apollo, and continued on in the 1970s with Skylab. The end of the Space Race was signaled by the joint Apollo-Soyuz Test Project. The U.S. continued on with the Space Shuttle Program, which was the focus of operations in the 1980s and 1990s. In 1993, the United States began an international effort to build a space station. Now known as the International Space Station (ISS), this joint project among the space agencies of the United States (NASA), Russia (Roscosmos), Japan (JAXA), Canada (CSA) and the eleven European countries of the European Space Agency will be a premier program in the new millennium. The Italian Space Agency also participates through separate agreements with NASA. Along with space exploration, NASA's mission includes space sciences, Earth sciences, and aeronautics research. Space science programs have included missions to the Moon and all the planets in the solar system. The Voyager spacecrafts, launched in 1977 to study the outer planets, are now exploring the outer edges of the solar system and will be the first human-made objects to journey into interstellar space. In Earth science, remote-sensing satellites such as Landsat and meteorological spacecraft have helped scientists understand the complex interactions between ecological systems on Earth. NASA's aeronautics research has helped to enhance air transportation safety, reliability, efficiency, and speed through such research programs as supercritical airfoils; supersonic and hypersonic flight; rotorcraft; gas turbine and jet engines; aircraft safety research (e.g., icing, windshear, general aviation, and human factors); and many other areas that affect the future of air transportation.

Since its inception in 1958, NASA has accomplished many great scientific and technological feats. NASA technology has been adapted for many non-aerospace uses by the private sector. At its 50th anniversary, NASA remains a leading force in scientific research and in stimulating public interest in aerospace exploration, as well as science and technology in general.

From 1915 until its incorporation into NASA in 1958, the National Advisory Committee for Aeronautics (NACA) provided technical advice to the U.S. aviation industry and helped make the country a leader in aeronautics research. NASA has continued this legacy through its work in fundamental aeronautics, developing and validating revolutionary technologies. NASA's X-15 was a revolutionary research aircraft whose 199 high-speed, high-altitude test flights during the 1960s yielded technologies used later in the space program, such as high-temperature materials, reaction control systems, and full-pressure pilot suits. (Credit: NASA)

In 2004, a new U.S. space exploration policy, encapsulated in the 2006 U.S. National Space Policy, committed the Nation to execute a sustained and affordable human and robotic program of exploration and develop, acquire, and use civil space systems to advance fundamental scientific knowledge of the Earth system, solar system, and universe. In 2005 and 2008, Congress passed NASA Authorization Acts that endorsed this policy direction and provided important guidance in program content and conduct in pursuit of these goals. Congress also developed a National Aeronautics Research and Development Policy in 2008, the first U.S. policy guiding the Nation's goals in aeronautics technology research and development. Through these policies, robust space exploration and aeronautics programs can augment U.S. scientific, security, and economic interests by stimulating excitement in learning, accelerating advances in technology, and spurring innovation. NASA proudly pledges to continue the work begun in 1958 by pursuing the American tradition of pioneering and exploration to redefine what is possible for the benefit of all humankind and by using NASA's unique competencies in scientific and engineering systems to fulfill the Agency's purpose and achieve NASA's Mission.

Part 1: Management Discussion and Analysis

NASA's Mission

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

NASA's Vision

NASA has adopted the spirit, principles, and objectives of the U.S. National Space Policy and the National Aeronautics Research and Development Policy as the Agency's Vision.

NASA's Values

NASA engages in tasks of extraordinary risk, complexity, and national priority. Mission-driven, with mission success at the cornerstone of its culture, the Agency rigorously manages requirements, schedules, facilities, human resources, and budgets.

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. NASA's purpose is to conduct successful space missions on behalf of the Nation and to explore, discover, and learn. Every NASA employee believes that mission success is the natural consequence of an uncompromising commitment to safety, technical excellence, teamwork, and integrity.

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.

Excellence: To achieve the highest standards in engineering, research, operations, and management in support of mission success, NASA is committed to nurturing an organizational culture in which individuals make full use of their time, talent, and opportunities to pursue excellence in both the ordinary and the extraordinary.

Teamwork: NASA strives to ensure that the Agency's workforce functions safely at the highest levels of physical and mental well-being. NASA's most powerful tool for achieving mission success is a multi-disciplinary team of diverse competent people across all NASA Centers. The Agency's approach to teamwork is based on a philosophy that each team member brings unique experience and important expertise to project issues. Recognition of and openness to that insight improves the likelihood of identifying and resolving challenges to safety and mission success. NASA is committed to creating an environment that fosters teamwork and processes that support equal opportunity, collaboration, continuous learning, 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. The Agency's leaders enable this environment by encouraging and rewarding a vigorous, open flow of communication on all issues, in all directions, among all employees without fear of reprisal. Building trust through ethical conduct as individuals and as an organization is a necessary component of mission success.

NASA's Organization

NASA's organization is comprised of NASA Headquarters in Washington, DC, 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 has a wide variety of partnership agreements with academia, the private sector, state and local governments, other federal agencies, and a number of international organizations that 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 Vision, Mission, and Values that are NASA.

To implement NASA's Mission, NASA is organized into four Mission Directorates.

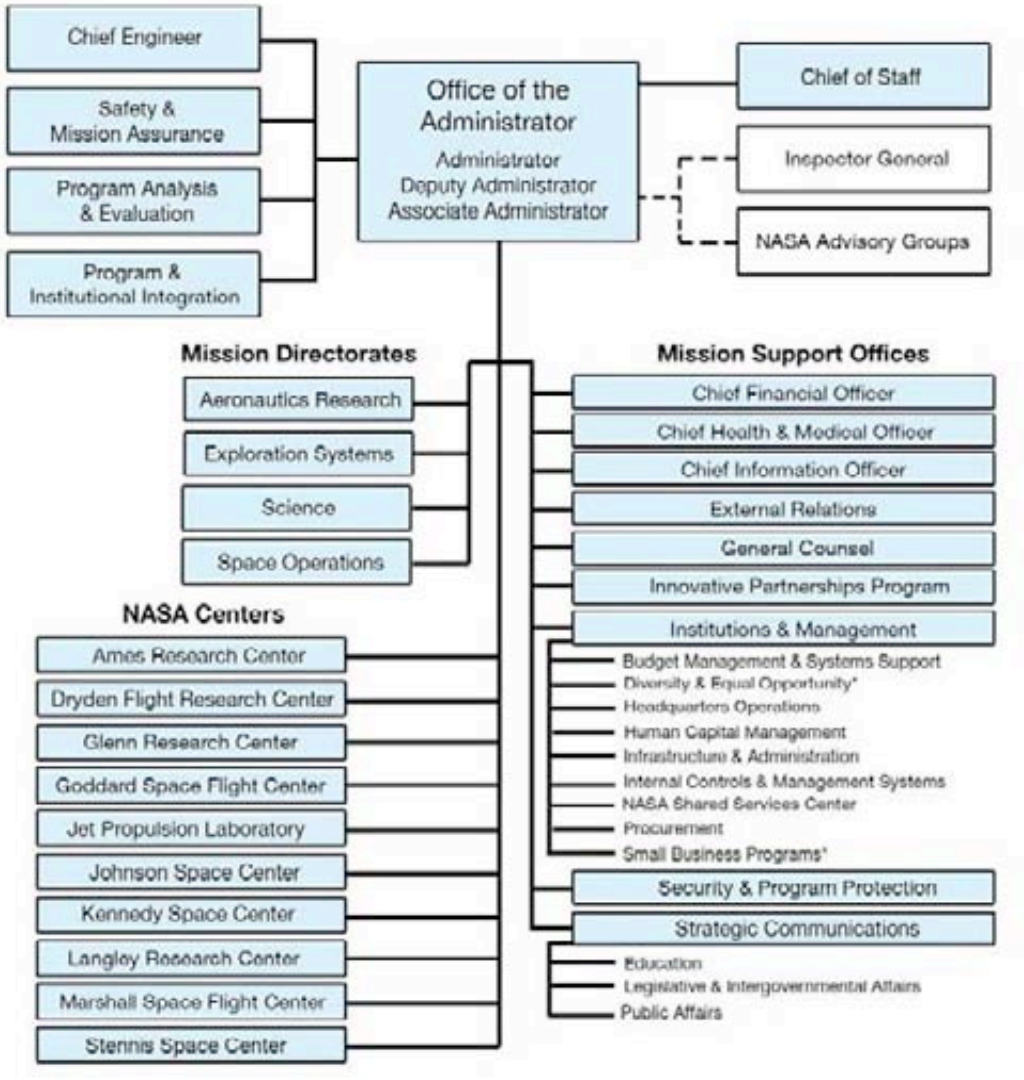
The **Aeronautics Research Mission Directorate (ARMD)** conducts fundamental research in aeronautical disciplines and develops capabilities, tools, and technologies that will enhance significantly aircraft performance, environmental compatibility, and safety, as well as the capacity, flexibility, and safety of the future air transportation system.

The **Science Mission Directorate (SMD)** conducts the scientific exploration of Earth, the Sun, the solar system, and the universe. Large, strategic missions are complemented by smaller missions, including ground-, air-, and orbiting space-based observatories, deep-space automated spacecraft, and planetary orbiters, landers, and surface rovers. SMD also develops increasingly refined instrumentation, spacecraft, and robotic techniques in pursuit of NASA's science goals.

The **Exploration Systems Mission Directorate (ESMD)** develops the capabilities and supporting research and technology that will enable sustained and affordable human and robotic exploration and will ensure the health and performance of crews during long-duration space exploration. In support of the more specific near-term goal of lunar exploration, ESMD is conducting robotic precursor missions, developing human transportation elements, developing the exploration architecture and needed technologies, and establishing international and commercial partnerships to foster this goal.

The **Space Operations Mission Directorate (SOMD)** 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. SOMD also is laying the foundation for future missions to the Moon and Mars by using the ISS as an orbital outpost where astronauts can gather vital information that will enable safer and more capable systems for human explorers.

The NASA's organization structure is presented below. NASA's Inspector General and Advisory Groups are relationships outside of the Agency, as reflected by the white boxes.



*In accordance with law or regulation, the offices of Diversity & Equal Opportunity and Small Business Programs maintain reporting relationships to the Administrator or Deputy Administrator.

NASA's Strategic Goals and Performance Management System

Measuring NASA's Performance

The *Government Performance and Results Act* of 1993 (GPRA) requires Federal agencies to issue plans for how they intend to spend budgeted resources and what they intend to achieve for this investment. NASA's most recent Strategic Plan, issued in 2006, sets forth the Agency's Mission and Strategic Goals. The annual Performance Plan, issued with the Agency's annual Budget Estimates, extends this plan to a more detailed level by establishing two levels of performance measures below the Strategic Goals: multi-year Outcomes and Annual Performance Goals (APGs). NASA managers calculate ratings for program performance for the multi-year Outcomes and APGs based on various factors including both internal and external assessments.

Internally, NASA monitors and analyzes each program's adherence to budgets, schedules, and key milestones. These analyses are provided during monthly reviews at the Center, Mission Directorate, and Agency levels to communicate the health and performance of a program. Based on the analyses, managers formulate appropriate follow-up actions. (Programs are identified in NASA's annual Budget Estimates, available at http://www.nasa.gov/budget/.)

Externally, advisory groups such as the NASA Advisory Council, the National Academies, and the Aerospace Safety Advisory Panel assess program content and direction. Also, experts from the science community review NASA's progress toward meeting the performance measures under Sub-goals 3A through 3D. Based on the review results, NASA managers assess each program's progress toward meeting its assigned multi-year Outcomes and APGs. Detailed ratings for multi-year Outcomes and APGs are provided in Part 2.

NASA's Strategic Goals

NASA is focused on six Strategic Goals to move forward in achieving the Agency's Vision. Each of the six Strategic Goals is clearly defined and supported by multi-year Outcomes that will enhance NASA's ability to measure and report Agency accomplishments in this quest. The Mission Directorates and Cross-Agency Support Programs pursue the Agency's Strategic Goals through programs and projects organized into Themes. Highlights of important FY 2008 results in each of the Agency's six Strategic Goals are presented below.

NASA's FY 2008 Performance Highlights

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

Responsible Mission Directorate: Space Operations
Theme: Space Shuttle

The front section of Space Shuttle Discovery juts above the ISS's new Japanese Pressurized Module (bottom) and the Japanese Logistics Module in this photograph taken by a crewmember during the STS-124 mission's second spacewalk in June 2008. (Credit: NASA)

In FY 2008, NASA's Space Shuttle Program continued an impressive string of International Space Station (ISS) assembly missions, delivering critical International Partner elements to orbit while helping the program complete the Shuttle's flight manifest in time for the fleet's retirement. The crews of STS-120 (October 2007), STS-122 (February 2008), STS-123 (March 2008), and STS-124 (May 2008) greatly enlarged and enhanced the ISS by integrating new elements—a node, two pressurized science modules, a robotic system, and a logistics module—and establishing Europe and Japan's first permanent foothold in low Earth orbit. (See Strategic Goal 2 for more details). After the May Shuttle mission, the Space Shuttle Program focused on the rare, simultaneous processing of two vehicles in preparation for the SM4 servicing mission to the Hubble Space Telescope. Throughout the fiscal year, the Agency also moved forward with plans for the orderly retiring of the Space Shuttle in 2010, achieving significant transition and retirement milestones: early manufacturing work on the last Space Shuttle external tank and main engine; identification and sharing of facilities, hardware, and most importantly, people with the maturing Constellation Systems Program; and the publication of the NASA Workforce Transition Strategy Initial Report and the Space Shuttle Programmatic

Environmental Assessment, addressing the potential environmental impacts associated with the transition and retirement of the Shuttle fleet (available online at http://www.nasa.gov/mission_pages/shuttle/main/pea.html).

For more on Shuttle missions go to http://www.nasa.gov/mission_pages/shuttle/main/index.html.

For more on the transition from Shuttle to Constellation go to http://www.nasa.gov/mission_pages/transition/home/index.html.

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

Responsible Mission Directorate: Space Operations
Theme: International Space Station

This was a banner year for NASA and the International Partners' work towards completing the ISS. In October 2007, Shuttle and ISS crews attached the Harmony node, providing additional room for the ISS crew and a new location for vehicles to dock. Most importantly, Harmony became the anchor point for the two new International Partner science laboratories. The Shuttle delivered the European Space Agency's (ESA) Columbus science laboratory in February. In March, the Shuttle delivered the Japanese Aerospace Exploration Agency's (JAXA) Kibo experiment logistics module and the Canadian Space Agency's Dextre (short for Dexterous Manipulator) robotics system. Finally, STS-124 delivered JAXA's Kibo pressurized module—the single largest piece of the ISS on orbit—in May.

The ISS shows off its new International Partners elements—the European Space Agency's Columbus module, Japan's Kibo Pressurized Module and Logistics Module (all three located where the main body of the ISS meets the truss in the photo), and Canada's Dextre robotic arm—as Space Shuttle Discovery pulls away at the end of STS-124 in June 2008. (Credit: NASA)

In March, ESA launched and docked for the first time their Automated Transfer Vehicle (ATV), Jules Verne, which will provide resupply and will periodically reboost the ISS into proper orbit. Resupply missions, crew rotation missions and numerous spacewalks were all successful. Of note, spacewalks were performed to repair a torn solar array and to replace a Beta Gimbal Assembly motor. A Russian spacewalk was performed to inspect and remove a Soyuz pyro bolt in support of the ongoing investigation on two Soyuz ballistic entries. The program will restore functionality to the Solar Array Rotary Joint (SARJ), which has had limited ability to rotate. In November 2008, the ULF-2 will clean, lubricate and replace trundle-bearing assemblies on the starboard SARJ.

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.

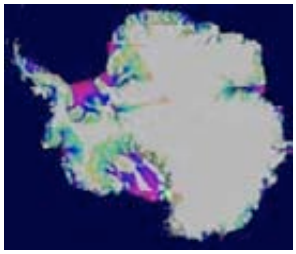
Sub-goal 3A: Study Earth from space to advance scientific understanding and meet societal needs.

Responsible Mission Directorate: Science
Theme: Earth Science

Twin observations of record low values of Arctic sea ice documented the extent and thinning of the sea ice. The first observation based on a new study led by Professor James Maslanik of the University of Colorado indicates older, multiyear sea ice in the Arctic is giving way to younger, thinner ice, making it more susceptible to record summer sea-ice lows like the one that occurred in 2007. The team used satellite data going back to 1982 to reconstruct past Arctic sea ice conditions, concluding there has been a nearly complete loss of the oldest, thickest ice and that 58 percent of the remaining perennial ice is thin and only two- to three-years old. In the mid-1980s, only 35 percent of the sea ice was that young and that thin according to the study, the first to quantify the magnitude of the Arctic sea ice retreat using data on the age of the ice and its thickness. Several earlier studies indicated last year's average sea ice extent minimum was the lowest on record, shattering the previous September 2005 record by 23 percent. The minimum extent was lower than the previous record by about one million square miles—an area about the size of Alaska and Texas combined.

The second observation came from a NASA-led study using QuiKScat observations. Researchers found a 23-percent loss in the extent of the Arctic's thick, year-round sea ice cover during the past two winters. This drastic reduction of perennial winter sea ice is the primary cause of this summer's fastest-ever sea ice retreat and subsequent smallest-ever extent of total Arctic coverage. Between winter 2005 and winter 2007, the perennial ice shrunk by an area the size of Texas and California combined. This severe loss continues a trend of rapid decreases in perennial ice in this decade. The scientists

observed less perennial ice cover in March 2007 than ever before, with the thick ice confined to the Arctic Ocean north of Canada. Consequently, the Arctic Ocean was dominated by thinner seasonal ice that melts faster. This ice is more easily compressed and responds more quickly to being pushed out of the Arctic by winds. Those thinner seasonal ice conditions facilitated the ice loss, leading to this year's record low amount of total Arctic sea ice. Unusual atmospheric conditions appear to have set up wind patterns that compressed the sea ice, loaded it into the Transpolar Drift Stream and then sped its flow out of the Arctic. When the sea ice reached lower latitudes, it rapidly melted in the warmer waters. The Arctic Ocean's shift from perennial to seasonal ice is preconditioning the sea ice cover there for more efficient melting and further ice reductions each summer. The shift to seasonal ice decreases the reflectivity of Earth's surface and allows more solar energy to be absorbed in the ice-ocean system.



Antarctic ice loss between 1996 and 2006 is shown overlaid on a Moderate Resolution Imaging Spectroradiometer (MODIS) mosaic image. The purple/red areas show the fastest ice loss. Green is slow. This image shows some of the results of an international study of Antarctic ice loss led by the Jet Propulsion Laboratory. (Credit: NASA)

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

Responsible Mission Directorate: Science
Theme: Heliophysics

Researchers discovered that explosions of magnetic energy a third of the way to the Moon power the substorms that cause sudden brightenings and rapid movements of the aurora borealis, also called the Northern Lights. Using the five THEMIS satellites, scientists found the cause to be magnetic reconnection, a common process that occurs throughout the universe when stressed magnetic field lines suddenly snap to a new shape, like a rubber band that's been stretched too far. Substorms produce dynamic changes in the auroral displays seen near Earth's northern and southern magnetic poles, causing a burst of light and movement in the Northern and Southern Lights. Substorms often accompany intense space storms that can disrupt radio communications and global positioning system signals and cause power outages. Solving the mystery of where, when, and how substorms occur will allow scientists to construct more realistic substorm models and better predict a magnetic storm's intensity and effects. The THEMIS observations confirm for the first time that magnetic reconnection triggers the onset of substorms and supports the model asserting that the initiation of a substorm follows a particular pattern. The pattern consists of a period of reconnection, followed by rapid auroral brightening and rapid expansion of the aurora toward the poles. This culminates in a redistribution of the electrical currents flowing in space around Earth.

This artist's concept shows substorms that cause the sudden brightenings and rapid movements of the aurora borealis. The THEMIS satellites line up once every four days along the equator and take observations synchronized with a network of 20 ground observatories in Canada and Alaska. During each alignment, the satellites capture data that allow scientists to precisely pinpoint where, when, and how substorms develop in space. (Credit: NASA)

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.

Responsible Mission Directorate: Science
Theme: Planetary Sciences

Laboratory tests performed by NASA's Phoenix Mars Lander identified water in a Martian soil sample. The lander's robotic arm delivered the soil sample to an instrument that heats the sample and then identifies the resulting vapors. The soil sample came from a trench approximately two inches deep. When the robotic arm first reached that depth, it hit a hard layer of frozen soil. Two attempts to deliver samples of icy soil on days when fresh material was exposed were foiled when the samples became stuck inside the scoop. Most of the material in the sample had been exposed to the air for two days, letting some of the water in the sample vaporize away and making the soil easier to handle.

"We have water," said William Boynton of the University of Arizona, lead scientist for the Thermal and Evolved-Gas Analyzer (TEGA). "We've seen evidence for this water ice before in observations by the Mars Odyssey orbiter and in disappearing chunks observed by Phoenix last month, but this is the first time Martian water has been touched and tasted."

"Mars is giving us some surprises," said Phoenix principal investigator Peter Smith of the University of Arizona. "We're excited because surprises are where discoveries come from. One surprise is how the soil is behaving. The ice-rich layers stick to the scoop when poised in the sun above the deck, different from what we expected from all the Mars simulation testing we've done. That has presented challenges for delivering samples, but we're finding ways to work with it and we're gathering lots of information to help us understand this soil."

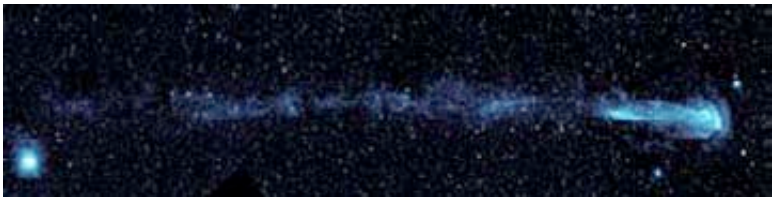
Since landing on May 25, 2008, Phoenix has been studying soil with a chemistry laboratory, TEGA, a microscope, a conductivity probe and cameras. Besides confirming the 2002 finding from orbit of water ice near the surface and deciphering the newly observed stickiness, the science team is trying to determine whether the water ice ever thaws enough to be available for biological systems and if carbon-containing chemicals and other raw materials for life are present.

Morning frost and exposed subsurface ice coat the "Snow White" trench dug by the Phoenix Mars Lander in September 2008. The upper half of the image is the water ice exposed by Phoenix earlier in the morning. The trench is approximately two inches deep and nine inches wide. (Credit: NASA/JPL-Caltech/University of Arizona/ Texas A&M University)

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

Responsible Mission Directorate: Science
Theme: Astrophysics

NASA's GALEX spacecraft spotted an amazingly long comet-like tail behind a star streaking through space at supersonic speeds. The star, named Mira, is a fast-moving, older star called a red giant that sheds massive amounts of surface material. Material blowing off Mira is forming a wake 13 light-years long, or about 20,000 times the average distance of Pluto from the Sun. Nothing like this has ever been seen before around a star. Astronomers say Mira's tail offers a unique opportunity to study how stars like the Sun die and ultimately seed new solar systems. As Mira hurtles along, its tail sheds carbon, oxygen and other important elements needed for new stars, planets, and possibly even life to form. This tail material, visible now for the first time, has been released over the past 30,000 years. Mira ejects the equivalent of Earth's mass every 10 years. It has released enough material over the past 30,000 years to seed at least 3,000 Earth-sized planets or nine Jupiter-sized ones.



This ultraviolet mosaic from GALEX shows a speeding star that is leaving an enormous trail of "seeds" for new solar systems. Mira appears as a small white dot in the bulb-shaped structure at right, and is moving from left to right in this view. The shed material can be seen in light blue. The dots in the picture are stars and distant galaxies. The large blue dot at left is a star that is closer to Earth than Mira. (Credit: NASA/JPL-Caltech)

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

Responsible Mission Directorate: Aeronautics Research
Theme: Aeronautics Technology

NASA researchers, in collaboration with San Jose State University and the Federal Aviation Administration (FAA), successfully completed a series of human-in-the-loop experiments that explored advanced concepts and technology for separation assurance. Separation assurance concepts and technologies ensure that aircraft maintain a safe distance from other aircraft, terrain, obstacles, weather, and selected types of airspace not designated for routine air travel. The

technology being developed by NASA and its partners is critical to relieving air-traffic controller workload, a significant constraint on airspace capacity. These experiments, which involved six professional controllers and 20 airline pilots, examined the performance of controllers, pilots, and separation-assurance automation in the face of nominal and dramatically increased (two- and three-times more) traffic demand through a complex airspace sector in the FAA's Indianapolis Center. The controller and pilot subjects received varying levels of automation support, including automated conflict detection, automated strategic conflict resolution, and automated tactical conflict resolution. The test scenarios included routine operations and off-nominal conditions. While additional investigation is needed to validate technologies and procedures in automated concepts such as those performed in these experiments, such concepts hold the promise of dramatically increasing the capacity of our air transportations system and address a key research need for the Next Generation Air Transportation System.

Thousands of aircraft cross the United States on a weekday afternoon in this snapshot of air traffic using NASA's Future Air Traffic Management Concepts Evaluation (FACET) tool. Keeping this multitude of aircraft safely separated is the focus of advanced concepts and technology being developed by NASA and its partners. The technology also helps aircraft avoid other hazards such as weather and terrain by automatically detecting hazards and providing resolutions. (Credit: NASA)

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

Responsible Mission Directorate: Exploration Systems
Theme: Advanced Capabilities

NASA is working to understand and mitigate the negative effects of the space environment on humans during long-duration human space mission and to develop new technologies that reduce mission resource requirements.

For missions to the Moon, lunar dust will present challenges for astronaut respiratory system contact, skin contact, and lengthy environmental contact. During 2008, NASA characterized the size range of inhalable lunar dust, then using simulated lunar dust, began to test the toxicity of various inhalable-size particles. NASA performed studies in collaboration with the National Institute of Occupational Safety and Health (NIOSH) that showed the ability of larger grains of dust to abrade human skin. NASA also performed studies with NIOSH that demonstrated that lunar dust remains reactive for several hours, depending on environmental conditions.

In addition, the successful completion of the Smoke and Aerosol Measurement Experiment (SAME) on the ISS in October 2007 offers new insight into smoke and particulate behavior in microgravity and will aid in developing fire safety procedures and monitors.

Volunteers work inside a test chamber to help NASA scientists at Johnson Space Center test the Carbon-dioxide and Moisture Removal Amine Swing-bed. For three weeks in spring 2008, the volunteers worked, slept, ate, and exercised in the chamber to simulate activities a crew would perform during a space mission. They reported that while the air smelled "a little artificial," the chamber remained comfortable, indicating that the hardware worked as anticipated. (Credit: NASA)

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

Responsible Mission Directorate: Exploration Systems
Theme: Constellation Systems

Development activities for the Constellation Program in FY 2008 included the completion of all project Systems Definition Reviews and Preliminary Non-Advocate Reviews, which gave approval for all projects to move towards Preliminary Design Reviews (PDRs). A completed PDR means that the project has adequately defined its goals and requirements, and can begin the design of hardware and systems. The Constellation Program already has moved some hardware from drawings into production and testing, including parachute, wind tunnel, and engine component testing. In addition, the

Orion Crew Exploration Vehicle project completed fabrication of the Crew Module for the Pad Abort 1 test. The Pad Abort 1 test is one of a series of tests to develop the Launch Abort System, which is a system to keep the crew safe during the launch phase.

In addition to these accomplishments, ESMD continued work to transition Space Shuttle infrastructure and workforce to the Constellation Program. ESMD has outlined the strategy and performance for each part of the Space Shuttle transition and retirement in a series of reports: the NASA Transition Management Plan, the NASA Workforce Transition Strategy Initial Report, and the Human Spaceflight Capabilities Forum 2 Meeting Report.

Technicians at Alliant Techsystems (ATK) in Utah inspect the facility's new test stand, which contains the inverted, full-scale inert abort motor for the Orion crew capsule's launch abort system. The abort motor, which anchors atop the capsule, is designed to pull Orion and its crew safely away from the Ares I rocket in the event of a mishap on the launch pad or during the first 300,000 feet of the launch. (Credit: ATK)

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

Responsible Mission Directorates: Exploration Systems and Space Operations
Themes: Constellation Systems, Advanced Capabilities, Space and Flight Support, and Innovative Partnerships Program

NASA implemented the Facilitated Access to the Space Environment for Technology Demonstration and Training project to better enable researchers to test new technologies in reduced-gravity conditions on commercial parabolic aircraft flights (which simulate the effects of being weightless) and eventually on commercial sub-orbital flights. The Innovative Partnerships Program facilitated seven NASA Small Business Innovative Research technology tests in September 2008 aboard a commercial aircraft, and flew five of those experiments in a flight-week shortened by Hurricane Ike. The Agency will release a broad call for technology demonstrations to fly in FY 2009.

SpaceX's Falcon 1 vehicle begins to rise off the pad during a test launch from Omelek Island, Kwajalein Atoll, in 2008. (Credit: SpaceX)

The Launch Services Program (LSP) continues to open the bidding process to a larger number of launch providers, in an effort to help the emerging commercial space sector gain experience to successfully compete for future missions. In March 2008, LSP established the NASA Launch Services Contract Follow-on Procurement Development Team. In April 2008, the PDT released a Request for Information to the launch service industry for a Small and Medium Class mission model. Responses have been received and are being evaluated. Space Exploration Technologies (SpaceX) was placed onto the NLS contract in April 2008, to include Falcon 1 and Falcon 9 launch services. LSP has also entered into one unfunded Space Act Agreement and is pursuing a second with companies that are actively funding new launch vehicles. The companies will share information with LSP that could aid in future certification efforts in return for LSP's advice and guidance on the development of the launch vehicle.

NASA's Commercial Orbital Transportation Services (COTS) project is an investment by NASA to spur development of a cost-effective, U.S. commercial capability to carry cargo to the ISS, with future options for transporting crew. The COTS project currently has funded Space Act Agreements with two partners, Space Exploration Technologies (SpaceX) and Orbital Sciences Corporation (Orbital). Orbital was selected in February in a second round competition for the COTS funding. The performance commitment in FY 2008 was to complete all negotiated deliverables for both funded Space Act Agreements. SpaceX and Orbital continue to make progress by completing the agreed-upon milestones leading up to the on-orbit flight demonstrations planned for 2010. SpaceX completed all six milestones outlined in their agreement for FY 2008, including the Preliminary Design Review for the third demonstration flight to the ISS and a multi-engine test firing of all nine engines, which is planned for the Falcon 9 launch vehicle. Orbital completed a Program Plan Review and a System

Requirements Review and is on track to meet the other milestones scheduled for this year. NASA continues to support unfunded agreements with other companies who are also planning to develop commercial space transportation capabilities.

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

Responsible Mission Directorate(s): Exploration Systems and Space Operations
Theme(s): Advanced Capabilities, and Space and Flight Support

Technicians move LRO into the vibration chamber at the Goddard Space Flight Center for testing in summer 2008 to make sure the spacecraft would be ready to withstand the harsh space environment. Later in the year, NASA transported LRO to the Kennedy Space Center, where it is being prepared for launch. (Credit: NASA/D. McCallum)

To enable a successful lunar return program, the characteristics of the lunar environment need to be understood. The LRO mission will create a comprehensive atlas of the Moon's features to help NASA select landing sites, identify lunar resources, and study the radiation environment. The LCROSS mission, which will be launched with LRO, will search for the presence of water ice. LRO and LCROSS are planned for launch in 2009.

The Constellation Architecture Team completed and delivered the Lunar Capability Concept Review. The team carefully considered five options for lunar surface systems, including surface elements and technical issues with habitat plans, operations concepts, and nuclear and solar power systems. The review captures the performance and cargo requirements of the lunar transportation system, the Ares V launch vehicle, and the Altair lander. The review allows the teams developing the Ares V and Altair vehicles to save time by working in parallel to refine designs for the lunar outpost, including habitats, rovers, and other systems needed to live on the Moon's surface for extended periods.

The Space Communication and Navigation Program (SCaN) is developing a unified space communication and navigation network capable of meeting both robotic and human exploration needs. The Core Systems Engineering Team is responsible for integrating the Space, Near Earth, and Deep Space Networks, and the future Lunar and potential Mars Networks.

SCaN is working with the Space Operations, Exploration Systems, and Science Mission Directorates to ensure that NASA communication and navigation needs are met. As part of this effort, the program works with the commercial sector to obtain and maintain reliable technologies at competitive prices for several projects including: the Communication Navigation and Networking Reconfigurable Testbed (CoNNeCT), a joint government–commercial project investigating reprogrammable (software-defined) radio technology for use during space exploration missions; the Tracking and Data Relay Satellite (TDRS) Continuation Project, which will upgrade the TDRS system with two new satellites designed to serve Science and Exploration System goals; and the Near Earth Network, which provides services for orbiting satellites and the Shuttle.

Discussion of Verification and Validation of Performance Data

NASA verifies and validates its performance data to provide a sufficient level of confidence to the Congress and the public that the performance information being reported is credible. In order to verify and validate performance measures, NASA has established and continues to improve procedures for collecting, maintaining, and processing performance data.

Currently, performance data is entered by program officials into a secure Web-based system where the data is stored and maintained during the reporting process. The system holds Mission Directorate and Mission Support Offices responsible for the reliability of performance measurement information for each of their assigned Annual Performance Goals and Outcomes. Each office has reviews in place to certify that the performance data is free of any anomalies. Additional reviews such as the Office of Management and Budget's (OMB's) Program Assessment Ratings Tool (PART) and periodic assessments by the Office of Inspector General help ensure the accuracy of performance results.

NASA is working to improve the verification and validation of the Agency's performance data per requirements set by OMB Circular A-11. For the FY 2008 PAR, NASA surveyed and interviewed each reporting Mission Directorate and Mission Support Office regarding their data collection and processing procedures. NASA has collected baseline standards, processes, and procedures and noted best practices within each program. NASA will continue to review and analyze the results of these surveys and interviews to implement any necessary improvements in next year's verification and validation process.

Diagnostic Analysis of 2008 Program Performance Results

NASA regularly reports on cost, schedule, and mission success, along with a number of factors that contribute to project health such as acquisition processes, facility availability, and safety. NASA is performing an Agency-wide diagnostic analysis of these performance results, specifically targeting the PART metrics, the GPRA measures, and other cost and schedule reporting requirements. This activity will enable comprehensive trend analysis and provide detailed information on the root cause of performance results.

As an initial step toward this Agency-wide diagnostic analysis, NASA is developing definitions and categories for typical causes that impact mission performance. These categories will include external factors such as changes in Agency partnerships and acts of nature, along with internal factors such as contract and project management. NASA will assess the root causes at a level of fidelity necessary to provide a comprehensive understanding of performance results.

NASA will use these categories and definitions, along with the results of evaluation studies, investigations, and audits to better understand program and project performance. This diagnostic analysis will enhance comprehensive reviews of the Agency's portfolio, provide additional insight into PART, GPRA, and other measures of Agency performance, and suggest actions to improve performance.

The Agency anticipates initial diagnostic analysis results in time for the FY 2009 Performance and Accountability Report.

The President's Management Agenda

The President's Management Agenda (PMA) is the President's strategy for improving the management and performance of the Federal government, with a focus on delivering results. Each quarter, the Office of Management and Budget (OMB) publishes a government-wide scorecard that rates overall status and progress by each Federal agency on the PMA initiatives. The scorecard uses a grading scale of green (success), yellow (mixed results), and red (unsatisfactory). For more information on the PMA and Agency scorecard results, please visit http://www.results.gov.

PMA Initiative	Intention	Ratings (As of September 2008)	
		Status	Progress
Strategic Management of Human Capital	Links the agency's mission and strategic objectives; processes, policies, and technologies ensure the continuous improvement of its strategic human capital management program.	Green	Green
Commercial Services Management	Improves the performance of commercial activities, either through competition or appropriate business process reengineering, including initiatives to create high performing organizations.	Green	Green
Improved Financial Performance	Produces accurate and timely financial information used to inform decision-making and drive results in key areas of operations. Implements a plan to continuously expand the scope of its routine data use to inform management decision-making in additional areas of operations.	Red	Green
Expanded Electronic Government	Demonstrates appropriate planning, execution, and management of major IT investments, using Earned Value Management or operational analysis, and has portfolio performance within 10% of cost, schedule, and performance goals.	Yellow	Green
Performance Improvement	Improves performance and management by linking performance to budget decisions and improved performance tracking and management.	Green	Green
Federal Real Property Asset Management	Ensures the management of agency property assets is consistent with the agency's overall strategic plan, the agency asset management plan, and the performance measures established by the Federal Real Property Council as stated in the Federal Real Property Asset Management Executive Order.	Green	Green

Program Assessment Rating Tool (PART) Status

OMB's PART is used by agencies across the Federal government to assess program performance and to drive a sustained focus on program results. The PART is a key component of the President's Management Agenda. PART assessments address overall program effectiveness, from how well a program is designed to how well it is implemented and what results it achieves.

NASA and OMB use PART to review programs covering all aspects of the Agency's Mission. The chart below lists those performing programs and their PART ratings. Programs that are performing have ratings of:

Effective: This is the highest rating a program can achieve. Programs rated Effective set ambitious goals, achieve results, are well-managed and improve efficiency.

Moderately Effective: In general, a Moderately Effective program has set ambitious goals and is well-managed. These programs likely need to improve their efficiency or address other problems in the programs' design or management in order to achieve better results.

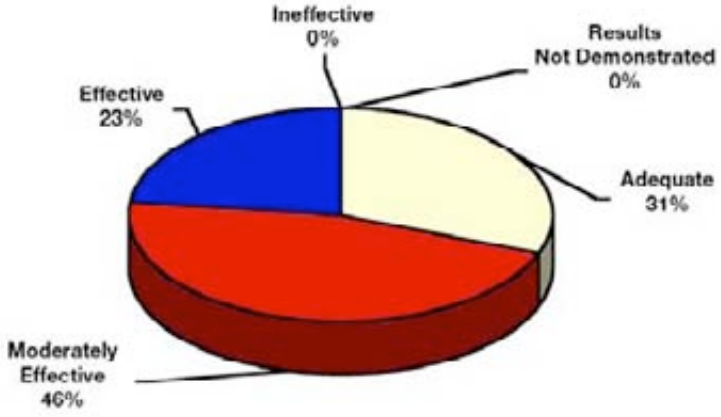
Adequate: This rating describes a program that needs to set more ambitious goals, achieve better results, improve accountability or strengthen its management practices.

Ineffective: Programs receiving this rating are not using tax dollars effectively. Ineffective programs have been unable to achieve results due to a lack of clarity regarding the program's purpose or goals, poor management, or some other significant weakness.

Results Not Demonstrated: This rating indicates that a program has not been able to develop acceptable performance goals or collect data to determine whether it is performing.

For additional information on PART and these assessments, please see the PART Status and Improvement Plans section in Part 4 or visit http://www.expectmore.gov.

Summary of PART Ratings
(13 Programs Assessed)



Note: The figure includes the score for Earth Science (rated Moderately Effective in 2008) and Earth-Sun Systems (rated Moderately Effective in 2005). NASA separated Earth-Sun Systems into two Themes, Earth Science and Heliophysics, for the Agency's FY 2008 budget request. Earth-Sun Systems is included in this summary because Heliophysics has not received a separate assessment.

Financial Overview

This section analyzes and discusses NASA's Financial Statements and the Agency's stewardship of the resources provided to it by Congress to carry out its mission. The Financial Statements, which describe the results of Agency operations and the Agency's financial position, are the responsibility of NASA's management.

The Agency's financial statements and accompanying notes are presented in their entirety in Part 3: Financials. NASA prepares the Consolidated Balance Sheet, Consolidated Statement of Net Cost, Consolidated Statement of Changes in Net Position and Combined Statement of Budgetary Resources statements, which provide a picture of the Agency's financial results. This overview focuses on the key information provided in the statements, which describes NASA's stewardship of the resources provided to it by Congress to carry out its Mission.

Limitations of the Financial Statements

The principal financial statements have been prepared to report the financial position and results of operation of NASA, pursuant to the requirements of 31 U.S.C. 3515 (b). While the statements have been prepared from the books and records of NASA in accordance with generally accepted accounting principles (GAAP) for Federal entities and the formats prescribed by the Office of Management and Budget (OMB), the statements are in addition to the financial reports used to monitor and control budgetary resources, which are prepared from the same books and records.

The statements should be read with the realization that they are for a component of the U.S. Government, a sovereign entity.

Financial Highlights

Results of Operations

Overall, the Agency's net cost of operations for FY 2008 was $18.4 billion, an increase of $3.3 billion, or 22 percent, from FY 2007. Each of the Agency's Business Lines experienced an increase in net cost as the Agency emphasized programs essential to achieving its strategic goals, particularly in the development of the Crew Exploration Vehicle (CEV) and the completion of the International Space Station.

NASA's programs and activities are carried out through four Business Lines: Aeronautics Research, Exploration Systems, Science, and Space Operations. The Consolidated Statement of Net Costs presents the Agency's gross and net costs by Business Lines, as shown below. 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. Earned revenue are those dollars earned for work performed primarily for other Federal agencies. Space Operations (including NASA's Shuttle and International Space Station programs), at $6.9 billion, and Science, at $5.9 billion, were the Agency's largest business lines in FY 2008. Exploration Systems net costs in FY 2008 grew by 51 percent to $4.8 billion, reflecting the Agency's increased spending related to meeting the objectives of retiring the Shuttle by 2010 and returning people to the moon by 2020.

The accompanying table provides net cost comparisons for FY 2008 and FY 2007 across the Agency's four major business lines.

Cost by Business Line
(Dollars in Millions)

	$ Change	% Change	Unaudited 2008	Unaudited 2007
Aeronautics Research				
Gross Costs	$ 83	12%	$ 783	$ 700
Less: Earned Revenue	(18)	-17%	88	106
Net Costs	**101**	**17%**	**695**	**594**
Exploration Systems				
Gross Costs	1,622	50%	4,839	3,217
Less: Earned Revenue	9	31%	38	29
Net Costs	**1,613**	**51%**	**4,801**	**3,188**
Science				
Gross Costs	925	17%	6,431	5,506
Less: Earned Revenue	174	49%	526	352
Net Costs	**751**	**15%**	**5,905**	**5,154**
Space Operations				
Gross Costs	935	15%	7,378	6,443
Less: Earned Revenue	90	30%	391	301
Net Costs	**845**	**14%**	**6,987**	**6,142**
Net Cost of Operations				
Gross Costs	3,565	22%	19,431	15,866
Less: Earned Revenue	255	32%	1,043	788
Net Costs	**$ 3,310**	**22%**	**$ 18,388**	**$ 15,078**

Aeronautics Research net costs increased $101 million in FY 2008. Cost increases are related to increased operations on several fundamental Aeronautics' programs and projects, including the NextGen—Airspace project, the Subsonic Fixed and Rotary Wing projects, and the Aero Ground Test Facilities. Additionally, research operations and costs increased in 2008 for the Hypersonics and Supersonics programs. These programs support the advancement of aeronautics knowledge for current air transportation systems and address key research needed for the next generation of air transportation systems.

Exploration Systems net costs increased $1,613 million in FY 2008. Exploration Systems' costs increased from 2007 to 2008 due to planned activities relating to the development of the next generation of space exploration vehicles that will replace the retiring Space Shuttles and other major program elements required to develop future space transport capabilities.

Science net costs increased $751 million in FY 2008. Science costs increased in support of significant advancements in both the preparation for the Mars Space Lab launch scheduled for October 2009 and the preliminary steps to complete the Integrated Service Instrument Module Critical Design Review for the James Webb Telescope. Science also made progress on a joint initiative with National Oceanic and Atmospheric Administration to design technology for the next-generation Geostationary Operational Environmental Satellite.

Space Operations net costs increased $845 million in FY 2008. The increase in operations was the result of progress toward the completion of the International Space Station, which was supported by four Shuttle flights in 2008 versus three in 2007, and preparation for the servicing mission to the Hubble Space Telescope.

Sources of Funding

NASA's funds available for use in FY 2008 operations totaled $20.9 billion, compared to $20.0 billion in FY 2007, an increase of $935 million. NASA's funding comes from various budgetary resources, as illustrated in the table below.

Available Budgetary Resources
(Dollars in Millions)

Line Item	$ Change	% Change	Unaudited 2008	Unaudited 2007
New Budget Authority	$ 1,088	7%	$ 17,373	$ 16,285
Unobligated Balance Brought Forward (Available)	281	13%	2,402	2,121
Other Resources Available	(434)	-27%	1,172	1,606
Total Available Resources	**$ 935**	**5%**	**$ 20,947**	**$ 20,012**
Total Obligations Incurred	2,564	15%	20,161	17,597
Total Remaining Resources	**$ (1,629)**	**-67%**	**$ 786**	**$ 2,415**

New Budget Authority, which provided 83 percent of NASA's available financial resources, was provided by Congress primarily through two-year appropriations. New budget authority available for FY 2008 increased by $1.1 billion compared to FY 2007.

Unobligated Balances, Brought Forward represents budget resources remaining at the end of the prior fiscal year that are available for use in the current fiscal year. Total Unobligated Balances at the end of FY 2008 were $786 million, a 67 percent decrease compared to the end of FY 2007. At the end of FY 2008, NASA's Unobligated Balance of appropriated funding was $565 million, a significantly lower balance brought forward as compared to the end of FY 2007. The decrease is attributed to the agency initiative to obligate funds more efficiently and effectively in the fiscal year they are received, which resulted in significantly lower unobligated balances at the end of FY 2008.

Other Resources includes funding received from reimbursable activity through which NASA shares its technology and provides services to other Federal agencies, including the Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), branches of the Department of Defense, and other public entities. Other Resources includes recoveries of budget resources that were obligated in a previous year. Other Resources was reduced by the FY 2008 Congressional rescission of $192 million.

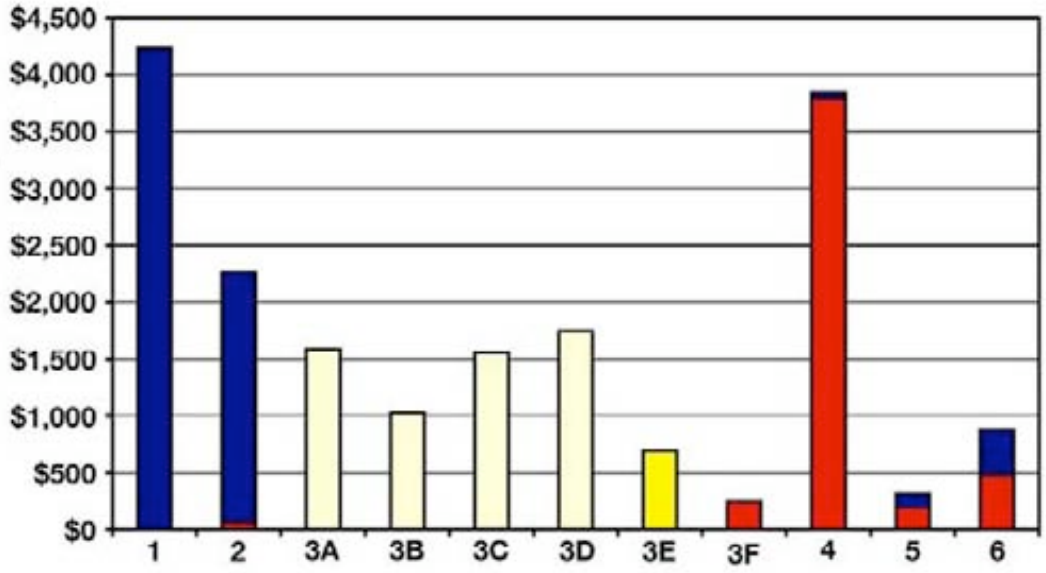
In FY 2008, **Obligations Incurred** represented $20.2 billion of the Agency's available budget resources used to accomplish the Agency goals within its four Major Business Lines: Aeronautics Research, Exploration Systems, Science, and Space Operations. In FY 2008, the increase in Obligations Incurred was consistent with the additional budget resources available for all business lines. Obligations Incurred represented a use of 96 percent of Total Available Resources in FY 2008, compared to 88 percent in FY 2007.

FY 2008 Expenditures Toward Strategic Goals

To measure expenditures toward Strategic Goals and Sub-goals, NASA maps the Mission Directorate's costs (i.e., Lines of Business as presented in the Statement of Net Cost) to the Strategic Goals and Sub-goals via Themes and programs. In 2003, NASA created Themes as a bridge to connect related Agency programs and projects to the Mission Directorates or equivalents that manage the programs. Themes group together similar programs, such as the programs that conduct Earth science or support the Agency's spaceflight missions, into budgeting categories. NASA uses Themes and programs to track performance areas, with Themes often contributing to a single Strategic Goal or Sub-goal, with a few exceptions. A description of each Strategic Goal or Sub-goal and supporting Mission Directorates and Themes is provided in the Performance Overview preceding this section.

NASA analyzes the initial fiscal year Operating Plan to determine the portion of each Mission Directorate budget allocated to each Theme and/or program, thus tying it to a particular Strategic Goal or Sub-goal. NASA analysts then use NASA's financial statements, in particular the Statement of Net Cost, to allocate Line of Business expenditures to the Themes and then Strategic Goals and Sub-Goals based on the relationships determined in the initial Operating Plan, as displayed in the following chart.

Expenditures by Strategic Goals and Sub-goals
(Dollars in Millions)



	1	2	3A	3B	3C	3D	3E	3F	4	5	6	Total
Aeronautics Research							$695					**$695**
Exploration Systems		$71			$4			$256	$3,791	$195	$484	**$4,801**
Science			$1,584	$1,021	$1,551	$1,749						**$5,905**
Space Operations	$4,227	$2,194							$54	$119	$393	**$6,987**
Total	**$4,227**	**$2,265**	**$1,584**	**$1,021**	**$1,555**	**$1,749**	**$695**	**$256**	**$3,845**	**$314**	**$877**	**$18,388**

Balance Sheet

The following table provides summary financial information for fiscal years 2008 and 2007.

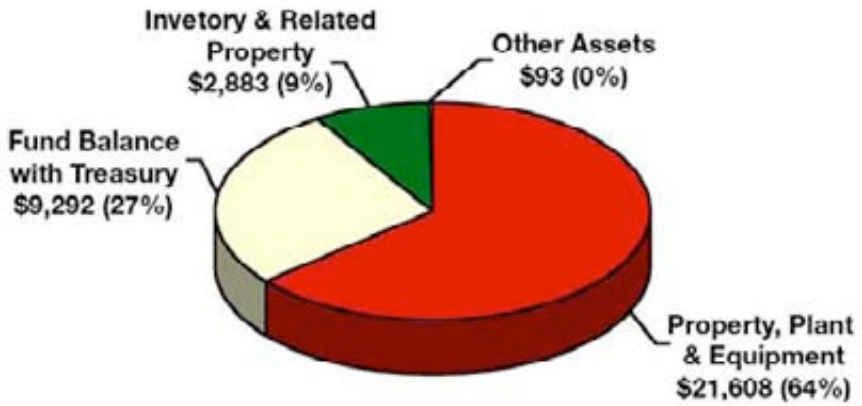
	$ Change	% Change	Unaudited 2008	Unaudited 2007
Assets:				
Fund Balance with Treasury	$ (680)	-7%	$ 9,292	$ 9,972
Inventory and Related Property, Net	(1,079)	-27%	2,883	3,962
Property, Plant and Equipment, Net	1,005	5%	21,608	20,603
Other Assets	(67)	-42%	93	160
Total Assets	**$ (821)**	**-2%**	**$ 33,876**	**$ 34,697**
Liabilities:				
Accounts Payable	$ 57	4%	$ 1,517	$ 1,460
Other Liabilities	226	15%	1,724	1,498
Federal Employee and Veteran Benefits	-	0%	64	64
Environmental and Disposal Liabilities	(20)	-2%	943	963
Total Liabilities	**263**	**7%**	**4,248**	**3,985**
Net Position:				
Unexpended Appropriations	(1,081)	-14%	6,389	7,470
Cumulative Results of Operations	(3)	0%	23,239	23,242
Total Net Position	**(1,084)**	**-4%**	**29,628**	**30,712**
Total Liabilities and Net Position	**$ (821)**	**-2%**	**$ 33,876**	**$ 34,697**

Source: PAR Part 3: Financials, Consolidated Balance Sheet, Unaudited.

Assets

NASA's Consolidated Balance Sheet shows that it had total assets of $33.9 billion as of September 30, 2008, a decrease of $821 million compared to September 30, 2007. Assets are owned by NASA and available for use in agency operations. NASA's assets are divided into four categories, as described in the chart below.

Assets by Category
(Dollars in Millions)



Total Assets by Category: $33,876

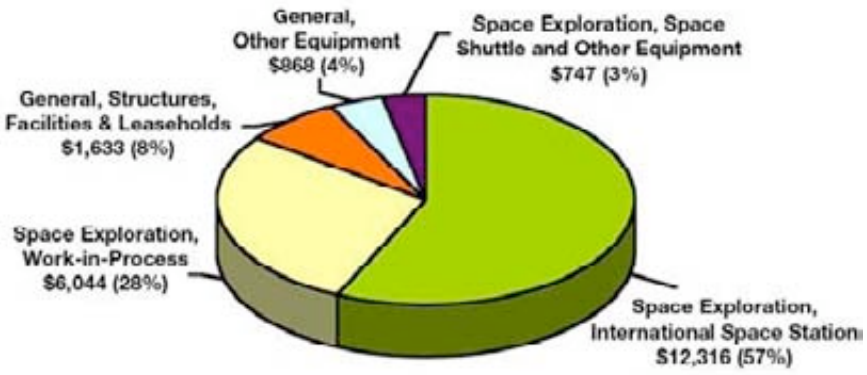
Source: PAR Part 3: Financials, Consolidated Balance Sheet, Unaudited.

Fund Balance with Treasury (FBWT), 27.4 percent of total assets, represents unexpended budget resources that are available to NASA. The $680 million reduction from the FY 2007 level is a result of an increase in outlays for contractor and agency costs for program activity.

The majority of NASA's assets are **Property Plant & Equipment (PP&E)**. The increase in PP&E of $1.0 billion was offset by decreases in the other three asset categories. Total PP&E increased due to an increase in Work-In-Process activity related to additions to the Space Shuttle and International Space Station.

PP&E assets are classified into two categories: Space Exploration PP&E and General PP&E. The chart below shows the various components of both categories. Space Exploration PP&E, consisting primarily of assets dedicated to the International Space Station, is the largest NASA asset category and represents almost 90 percent of the PP&E assets. General PP&E represents buildings, structures and other equipment at the various NASA locations.

Property, Plant & Equipment, Net
(Dollars in Millions)



Total Property, Plant & Equipment: $21,608

Source: PAR Part 3: Financials, Note 7. Property, Plant, and Equipment, Net, Unaudited.

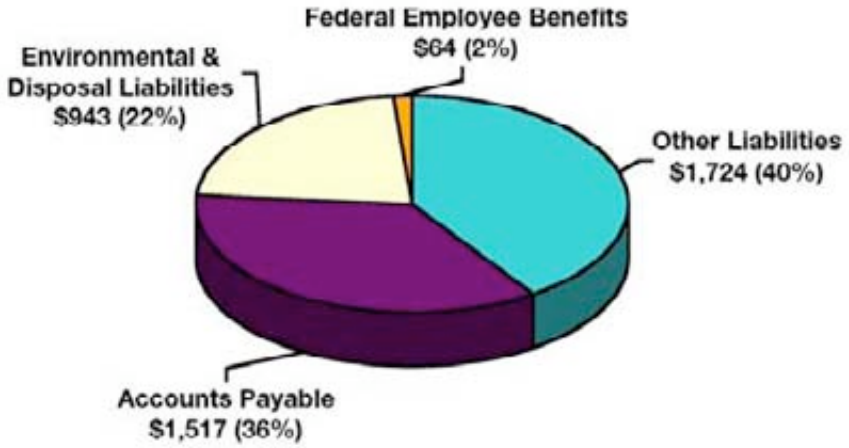
The third largest asset category, **Inventory and Related Property**, decreased by $1.1 billion due to the usage of Inventory related to Shuttle. Inventory and Related Property includes property held by NASA and its contractors both for normal Agency operations and for emergencies.

The final category, **Other Assets**, includes Investments and Accounts Receivables. NASA has investments in intragovernmental securities to fund the Endeavor Teacher Fellowship Trust Fund and the Challenger Trust Fund. Investments were valued at $17 million for both FY 2008 and FY 2007. Accounts Receivable dropped by nearly $67 million as a result of improved efficiency in processing billings and collections in the same month.

Liabilities

NASA had total liabilities of $4.2 billion as of September 30, 2008, an increase of $263 million compared to September 30, 2007. The major categories of liabilities are detailed in the chart below.

Liabilities by Category
(Dollars in Millions)



Total Liabilities by Category: $4,248

Source: PAR Part 3: Financials, Consolidated Balance Sheet, Unaudited

Accounts Payable represents actual amounts owed for goods and services received, as well as accruals for estimated grant activity. **Other Liabilities** represents estimated contractor costs incurred but not yet paid, as well as contingent liabilities for litigation claims, accrued payroll and related costs and liability for advances and prepayments. Other Liabilities accounted for most of the increase, $226 million, while Accounts Payable increased by $57 million. These increases were primarily due to increased activity for various Agency initiatives, including development of the Crew Exploration Vehicle and lunar return and transport programs to facilitate future exploration of the solar system.

Federal Employee and Veteran Benefits are amounts that NASA estimates for future worker's compensation liabilities for current employees.

Environmental and Disposal Liabilities are estimated cleanup costs for actual or anticipated contamination from waste disposal methods, leaks, spills, and other NASA activity that created or could create a public health or environmental risk. The estimate represents the amount that NASA expects to spend for the remediation of contamination. The estimate represents the amount that NASA expects to spend in the future to remediate currently known contamination. This estimate could change in the future due to the identification of additional contamination, inflation, deflation, or changes in technology or applicable laws and regulations. The estimate will also change through ordinary liquidation of these liabilities as the cleanup program continues.

Net Position

Net Position represents the sum of Cumulative Results of Operations and Unexpended Appropriations, which is reported on the Consolidated Balance Sheet and the Consolidated Statement of Changes in Net Position. Net Position is the difference between the current value of the Agency's assets less its liabilities. NASA's Net Position decreased by $1.1 billion.

Financial Operations Performance Indicators

The Metric Tracking System (MTS) is a performance measurement system that captures key financial management indicators across the Federal Government. The tool's intent is to provide government managers, Congress, and other stakeholders information to assess the financial management health of the Federal Government as a whole and for each individual agency. MTS identifies performance goals for each financial management indicator and rates the status of performance of federal entities in meeting those goals.

NASA's annualized performance on MTS goals is summarized on the following table. Of the nine metrics reported monthly to the Office of Management and Budget (OMB), NASA is fully successful on eight and needs to improve on one.

Financial Management Indicators	FY 2008	FY 2007
Fund Balance with Treasury	Green	Green
Suspense Greater than 60 Days	Green	Yellow
Delinquent Accounts Receivable	Green	Green
Electronic Payments	Green	Green
Invoice Payments – Paid on Time	Red	Yellow
Invoice Payments – Interest Penalties Paid	Green	Green
Credit Cards – Travel Card Delinquency Individual Billed	Green	Yellow
Credit Cards – Travel Card Delinquency Centrally Billed	Green	Green
Credit Cards – Purchase Card Delinquency	Green	Green

MTS Goal Status

Fully Successful	Green	Minimally Successful	Yellow	Unsuccessful	Red

NASA's performance has improved to a "fully successful" rating for the *Suspense Balances Greater than 60 Days Old* metric. Improvements were accomplished through the implementation of policies to establish more stringent internal aging thresholds for suspense items and through expanded monitoring controls to track the status of suspense balances. *Credit Cards – Travel Card Delinquency Individual Billed* improved to "fully successful" due to the payment of bankcard charges that were past due over 31 days. Management placed additional emphasis in the past year on the importance of Federal employees meeting payment deadlines.

NASA's performance has declined to "unsuccessful" on *Invoice Payments – Paid on Time."* In FY 2007, NASA centralized Agency functions from the NASA Center locations to the NASA Shared Service Center (NSSC). This transition resulted in a temporary lag time in processing payments on time, including invoice payments, due to various instances, including vendor lag in forwarding invoices to the NSSC and the training curve of NSSC staff. Since all NASA Center operations are now fully transitioned to the NSSC, NASA expects to see improvement in these areas in the upcoming year.

Systems, Controls, and Legal Compliance

Management Assurances

Administrator's Statement of Assurance

November 14, 2008

NASA is committed to a robust and comprehensive internal control program that meets the objectives of the *Federal Managers' Financial Integrity Act* (FMFIA) as well as related laws and guidance. Further, however, we recognize that ensuring the effective, efficient, and responsible use of the resources that have been provided to the Agency is not only good stewardship, but also the right approach to maximizing our progress toward the realization of our exploration goals. Within the Agency, I have made it clear that I am responsible for the establishment and maintenance of a sound system of internal control. In turn, I have made these responsibilities clear to my program management, mission support officers, and Center management—and they have communicated this responsibility to their subordinates. As a result, managers and employees throughout the Agency are active on a daily basis in identifying or updating key control objectives, assessing risks, implementing controls or other mitigating strategies, conducting reviews, and taking corrective actions as necessary. In addition, NASA's basic governance structure—as represented by the Strategic Management Council, Program Management Council, and Operations Management Council—provides both the top-level guidance and the integration required to ensure our internal control program is operating effectively.

During the past year, we have taken significant steps to strengthen our internal control program. The Office of Internal Controls and Management Systems (OICMS) has been established as the functional lead for NASA's internal control program. The Assistant Administrator for OICMS initiates key internal control plans and assessments and provides recommendations on opening and closing major deficiencies to the Operations Management Council through the Senior Assessment Team. This year the OICMS updated its policy, NASA Internal Control, to be current with OMB Circular A-123 and its appendices. The revised policy also more clearly defines roles and responsibilities of senior management. The OICMS also developed an Internal Control Program Handbook to provide guidance and consistency during the annual Agency-wide Statement of Assurance (SoA) process. Risk assessments were documented using an OICMS developed evaluation tool. The OICMS staff continuously interacted with Headquarters and Center points-of-contact to critique each Headquarters office or Center self assessment of controls for accuracy and completion. In FY 2009, the OICMS plans to begin quality assurance and internal control deficiency audits at NASA. Audit teams will begin by reviewing Headquarters offices with the expectation of expanding the program to NASA centers by 2010.

With respect to internal control over financial reporting, we completed the third year of a planned three-year effort to assess the operation of key controls over financial reporting. This year's activities included reviews of the Agency's Cost Management, Grants Management, Human Resource and Payroll Management, and Procurement and Payment Management cycles. In FY 2008, NASA centralized the accounts payable, accounts receivable, and fund balance with treasury functions at the NASA Shared Services Center. An assessment was conducted of the re-designed processes prior to transition to provide assurance that adequate controls existed to mitigate potential risks. At the conclusion of these internal control reviews, no new material weaknesses were identified.

The Office of Management and Budget (OMB) provides general guidance on implementing and reporting on internal control through Circular A-123, *Management's Responsibility for Internal Control*, and Circular A-123, Appendix A, *Internal Control Over Financial Reporting*. With respect to the overall adequacy and effectiveness of internal control within the Agency, I hereby submit a qualified Statement of Assurance that NASA's internal controls meet the objectives of FMFIA. I am submitting this qualified statement based on the fact that our ongoing reviews confirmed that two of NASA's previously reported material weaknesses—Asset Management and Financial Systems, Analyses, and Oversight—remain. These conditions continue to warrant Agency-level attention as material weaknesses.

I am pleased to report that NASA has eliminated Information Technology Security from the list of material weaknesses reported based on the progress made in implementing corrective actions related to this control deficiency. Also, no new material weaknesses were identified during the past year's internal control activities and reviews. Therefore, concerning the effectiveness of internal control over operations (FMFIA 2) I am submitting an unqualified statement of assurance. However, due to the continuing material weaknesses in Asset Management and Financial Systems, Analyses, and Oversight, I am submitting a qualified statement of assurance that the Agency's controls over financial reporting (FMFIA 2) as of June 30, 2008, were operating effectively.

In addition, in accordance with Section 4 of FMFIA, as well as the *Federal Financial Management Improvement Act* (FFMIA), NASA management is responsible for reporting on our implementation and maintenance of 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. We have made substantial strides during the past several years in our ability to prepare financial statements using information generated by our financial management systems; providing reliable and timely financial information to our managers; accounting for our assets consistently and reliably; and performing all of these functions in compliance with Federal accounting standards. However, we have not yet addressed all of the related issues identified by the financial statement auditors. As a result, I consider this vulnerability to qualify as a non-conformance under the intent of FMFIA and declare that NASA's financial management systems are not substantially compliant with the requirements of FFMIA as of September 30, 2008.

We will continue to aggressively address the weaknesses mentioned earlier, and work to ensure that our internal control program prevents new material weaknesses from developing. I am pleased that no new material weaknesses have been reported for the past four years. As required, we are also providing, below, a status report on each of the two remaining material weaknesses, including progress made on corrective actions during the past year and planned actions for the coming year.

Michael D. Griffin
Administrator

Remediation Program for Continuing Material Weaknesses

Asset Management

Background: The NASA Inspector General and the Agency's independent financial statement auditors have identified inadequate controls over NASA's legacy Property, Plant and Equipment (PP&E) as a material weakness. This weakness could prevent material misstatements from being detected and corrected in a timely manner. In particular, the Agency's auditors found that NASA's processes for identifying and recording PP&E costs had historically relied primarily on a retrospective review of disbursements to determine amounts that should be capitalized as assets. Additionally, the auditors found that a lack of integrated and comprehensive property systems limited the Agency's ability to record, track and monitor property and property-related transactions as they occur throughout the property transaction life cycle.

Accurately tracking and recording PP&E costs is critical to the integrity of the Agency's financial statements and to the accurate valuation of individual asset items. The responsibility for resolving this issue is shared by the Office of the Chief Financial Officer, Office of Procurement, Office of Institutions and Management, and the Agency's Program and Project managers.

FY 2008 Activities: In FY 2008, NASA continued implementation of the FY 2007 Change in Accounting Principle related to the Agency's asset capitalization practices to better align NASA's policies, processes, and systems with published accounting standards. NASA's programs and projects, with the exception of the Space Shuttle and International Space Station, are applying the policy, which requires the identification of capital PP&E, at the time the PP&E is planned for acquisition. This approach identifies capital assets before they are acquired and directly addresses FY 2007 internal control weaknesses identified by the Agency's independent auditors.

Consistent with the revised policy, contractors are reporting costs incurred on each individual asset through their regular monthly cost reporting process. This improves the Agency's ability to record costs at the time costs are reported and to reconcile asset costs with that contractor cost reporting. The Agency now performs reconciliations between costs recorded in the financial system through the new policy and those reported by contractors in the Contractor-Held Asset Tracking System (CHATS). These improvements directly address FY 2007 internal control weaknesses identified by the Agency's independent auditors.

NASA updated its PP&E accounting policy to reflect the requirements of the new policy. NASA Procedural Requirements (NPR) have also been drafted to provide implementation guidance for the policy.

Also in FY 2008, NASA implemented the first phase of the financial management system's Integrated Asset Management (IAM) module. This module integrates asset records for the Agency's personal property with the financial management system. With the inclusion of personal property records in IAM, NASA is no longer reliant on an external system, NASA Equipment Management System (NEMS), to track and record cost on individual items of personal property.

NASA's revised capital acquisition policy and the implementation of IAM give NASA the ability to identify, record, track, and monitor personal property and personal property-related transactions as they occur throughout the property transaction life cycle. This directly addresses FY 2007 internal control weaknesses identified by the Agency's independent auditors.

With the implementation of the IAM module, depreciation is now calculated for personal property in the Agency's financial system. Previously, depreciation for personal property was calculated outside of the system on Excel spreadsheets. This automation reduces the possibility of manual and/or formulaic spreadsheet errors. This directly addresses an FY 2007 internal control weakness identified by the Agency's independent auditors.

FY 2009 Activities: NASA will continue to monitor the implementation of the Agency's revised capital acquisition policy. Assets identified under this policy will be tracked through the IAM module. Depreciation calculations made by that module are reviewed to ensure their accuracy before being posted into the accounting system.

NASA intends to increase the asset classes tracked in the IAM Module by incorporating real property in FY 2009. This will further enhance the Agency's controls over PP&E and improve the integration of systems, consistent with the requirements of the *Federal Financial Management Improvement Act* (FFMIA) of 1996.

NASA has identified and will pursue throughout FY 2009 alternative, cost effective strategies for addressing weaknesses in the Agency's ability to substantiate the financial statement balances for the Space Shuttle and International Space Station.

Financial Systems, Analyses, and Oversight

Background: NASA implemented a single integrated financial management system in FY 2003 to replace 10 disparate legacy financial systems and over 120 subsidiary systems. The introduction of the new system highlighted long-standing data and process issues. Additionally, challenges in system processing, configuration, and capabilities resulted in abnormal balances and data errors. To address these challenges NASA implemented compensating controls to ensure that the financial system meets financial reporting requirements. NASA completed a major upgrade to its financial management system at the start of FY 2007, which resolved several outstanding processing and control issues. The system upgrade also resulted in the reduction of manual operations and reconciliations, enhanced cost management processes, and streamlined the Agency's budget distribution processes.

In FY 2008, the Agency continued to make significant progress in improving its financial management systems analyses and oversight. The Agency implemented a Comprehensive Compliance Strategy (CCS) for ensuring compliance with generally accepted accounting principles (GAAP) and other financial reporting requirements. Also during the year, NASA continued efforts to improve financial operations with the transition of the Fund Balance with Treasury, Accounts Payable, and Accounts Receivable functions from the NASA Centers to the NASA Shared Services Center

FY 2008 Activities:

Compliance and Financial Reporting: The Comprehensive Compliance Strategy (CCS) focuses on ensuring compliance with GAAP and other financial reporting requirements. The CCS also covers the standards and requirements necessary to cure deficiencies noted in audit and related reports. The CCS serves as the basis for implementing comprehensive proactive corrective actions as may be required; and, it provides the guiding principles for executing effective financial management functions and activities with internal control and compliance solutions inherently embedded in the processes.

The CCS delineates the generic control environment necessary to ensure functions and activities adhere to financial reporting requirements. Also, the CCS provides a solid platform for sound financial management practices and standards, working in unison with NASA financial management policy including: Financial Management Requirements (FMR), Financial Management Operating Procedures (FMOP), and the Continuous Monitoring Program (CMP). In addition, the CCS provides the structure for overarching financial reporting processes and related financial information systems.

The components of the CCS are updated on a continuous basis to ensure that the strategy remains up to date with all governing requirements, including, but not limited to, current government regulations, accounting standards, communications from external auditors and other independent oversight bodies, reviews, and assessments. These updates also become the basis for developing issue-specific corrective actions or other remediation which may that become necessary for continual full compliance with GAAP and other regulatory requirements.

Data Integrity: NASA implemented the Continuous Monitoring Program (CMP) in FY 2008 to support execution of the CCS and improve upon the predecessor Agency-level Periodic Monitoring Controls process. The CMP mandates standard control activities, aligned with the CCS framework, that are required to be performed monthly by Headquarters and NASA Centers, including the NASA Shared Services Center. NASA Headquarters reviews, evaluates and tracks the performance of the Center-reported control activities to ensure prompt remediation of Center data anomalies, identification of systemic issues, and identification of Agency process improvement opportunities. The CMP also requires both quantitative and qualitative exception reporting, to the NASA Agency OCFO for review and action. It further requires Center management to certify the completion of control activities, maintain audit evidence and support for the A-123, Appendix A, requirements. The results are summarized and reported agency-wide through "Dashboards" on a monthly basis.

The CMP is the overall framework of management and internal controls that uses real-time activity at the financial transaction level to monitor and ensure compliance with GAAP. It directly enhances the Agency's A-123, Appendix A, internal controls over financial reporting program and provides evidence that balances and activity reported in NASA's financial statements are auditable. In addition, it also ensures that errors and/or discrepancies are identified and corrected in a timely manner and that ongoing management reviews and validations of financial data and internal controls are completed timely to prepare the Agency's financial statements.

System Enhancements: In FY 2008, NASA implemented the first phase of its Integrated Asset Management (IAM) module for the financial management system. This module creates processes that integrate NASA's personal property systems with the Agency's financial system. These enhancements help to achieve the financial system integration required by the *Federal Financial management Improvement Act* (FFMIA) of 1996.

Unfunded Environmental Liability: NASA enhanced the Unfunded Environmental Liability (UEL) process through the implementation of a coordinated effort between the Office of the Chief Financial Officer and the Environmental Management Division. A joint review process was implemented to validate the UEL estimate and reconcile year-to-year.

The joint review team ensures that estimates are reasonable and properly supported, and performs a reconciliation of changes in estimates from year to year.

NASA also began developing an approach and implementation strategy to adhere to the requirements of Statement of Federal Financial Accounting Standards (SFFAS) No. 6, "Accounting for Plant, Property, and Equipment," which requires recognition of a liability for cleanup costs associated with plant, property and equipment (PPE) at the end of its useful life.

Optimized Financial Operations: During FY 2008, NASA transitioned significant financial management operations, Accounts Payable, Accounts Receivable and Fund Balance with Treasury reconciliation, from its centers to the NSSC. The full consolidation of these activities at the NSSC has significantly improved consistency, reduced redundant processes, and gained efficiencies. With these financial operations staff centrally located, communication has been enhanced and accounting standards and financial policies are being applied consistently. Performing these financial operations at the NSSC optimized resource management and simplified training on financial system updates and other accounting changes.

FY 2009 Activities: NASA will continue the monitoring and oversight of the effectiveness of the CCS through monthly submissions of the CMP, as well as through periodic CMP compliance reviews conducted by the Evaluation Monitoring and Testing (EMT) Program. These monitoring tools are intended to provide another level of the necessary refinement for achieving management assurance regarding compliance with the CCS. The EMT reviews serve as a program to periodically measure the effectiveness of the CMP as well as ensure and validate the operation of a sound system of internal control over financial reporting. The EMT reviews provide the roadmap for the ongoing achievement of financial management excellence.

NASA will further develop its written policy and procedures to address current requirements related to reporting UEL and will continue to refine its joint review process to ensure the UEL is accurately reported in the financial statements. Additionally, NASA will finalize the approach and implementation strategy for SFFAS No. 6, "Accounting for Plant, Property, and Equipment," which requires recognition at the time of asset acquisition of a liability for cleanup costs associated with plant, property and equipment at the end of its useful life.

An additional system upgrade is planned for FY 2009 to add NASA's real property into the Integrated Asset Management module. This will further enhance integration of data and systems, reducing the possibility of errors.

The Agency will continue to monitor processes that have transitioned to the NSSC to ensure optimal operations. Metrics have been defined and are used to monitor performance against clear standards for successful operations. The information is provided to the Office of the Chief Financial Officer (OCFO) on a monthly basis. OCFO plans to review compliance with the *Prompt Payment Act* at the NSSC in FY 2009 to assess their progress in meeting the requirements for operation of the disbursement process. OCFO will continue to work closely with NSSC management to resolve issues identified and develop remediation plans as necessary.

Government Accountability Office (GAO) High-Risk List

NASA has been on the GAO High-Risk List in the area of Contract Management since 1990, when the first High-Risk List was published. In the most recent GAO update to the High-Risk List, issued in January 2007, GAO acknowledged NASA's progress in addressing contract management issues highlighted in previous high-risk reports, but called for further improvement.

NASA has assembled an integrated cross-functional team to work the associated issues. The team produced a comprehensive Corrective Action Plan in October 2007, and is now implementing that plan. The plan, with its Executive Summary document, meets Office of Management and Budget (OMB) requirements. It includes a description of the issue, measurable goals, specific milestones, and the responsible officials. The NASA team continues to work with GAO and OMB to ensure that their concerns are identified and addressed. NASA's status reports for the Corrective Action Plan are available at http://www.nasa.gov/budget.

Looking Forward

As FY 2009 begins, NASA, like the rest of the federal government, is focused on the Presidential transition and the Agency's current financial and economic challenges. Every agency has increasing responsibility to demonstrate that it is a good steward of the assets, capabilities, and workforce entrusted to it by the American taxpayer. Part of this responsibility is good communication, not only to the incoming Administration that will guide the direction that federal agencies will take in the coming years, but also to the public.

Performance measurement and reporting is one of the tools NASA uses to communicate to its stakeholders and the public how the Agency is progressing toward achieving its Strategic Goals and how it is functioning overall. The Agency will continue to evaluate its budget execution performance to ensure efficient and effective use of its current-year budget allocation. NASA is refining and expanding how programs and projects measure and report their performance, including adherence to cost and schedule. Working with the Office of Management and Budget and the Government Accountability Office, NASA is developing reports that analyze individual science and exploration projects and provide synopses of the Agency's entire portfolio. In the coming year, NASA will identify requirements for external reporting on contracts management. Furthermore, the Agency will develop metrics for institutional performance, such as workforce management, for the 2009 Strategic Plan.

In addition to improving performance measurements, NASA will continue strengthening Agency-wide support services. NASA is a Nation-wide family of Centers, laboratories, and facilities. Each of these locations has its own unique history and culture. While NASA is proud of this diversity, these multiple locations yield challenges in the form of multiple financial, IT, and other support services. Consolidation and standardization of support services is—and will continue to be—a focus of NASA's Mission Support Offices. For example, the Agency IT Services Program will be consolidating networks and network management and improving security. This program will allow NASA to standardize security firewalls and overall IT service across the Centers. As part of the effort to improve security, the Agency IT Services Program will test and implement use of "smart card" access to computer desktops using the new federal government's "smart badge." This will help prevent unauthorized users from accessing NASA's internal information.

In another effort to strengthen support services, the Agency created the NASA Shared Services Center (NSSC) to consolidate and standardize the delivery of high volume finance, human resources and procurement support services. The NSSC is a partnership between the private sector and federal and state government. Adopting the shared services business model for delivery of support services facilitates the standardization of business processes and leveraging of technology that result in better service at lower cost. The Agency completed the planned transition of support activities to the NSSC in 2008. In 2009, the NSSC will conclude its public and private sector benchmarking initiative, which is comparing and contrasting NASA support processes with the processes of top performers in the private and public sector and to identify best practices for adoption where appropriate. The Agency will use benchmarking results to set cost reduction targets for core finance support services in FY 2009.

NASA also will continue to improve its financial management and reporting in the coming year. The Agency will remain focused on addressing the noted material weaknesses in financial systems, analyses, and oversight, and in its asset management. In FY 2009, NASA will continue to refine the comprehensive compliance strategy and its supporting monitoring program, which were implemented in FY 2008. This effort impacts the processing, analysis, and reporting of financial data Agency-wide and has already improved the quality of the Agency's financial information and reporting. NASA will evaluate the program throughout the year to ensure that federal and generally accepted accounting standards are fully integrated into the Agency's accounting policies and practices. For more information about specific actions that NASA will take to address these material weaknesses, please see the Systems, Controls, and Legal Compliance section.

In addition to these financial management improvement efforts, NASA will take steps in FY 2009 to improve the timeliness and accuracy of the Agency's grants accounting. NASA's Centers and Mission Directorates award grants to advance research and development in support of its programs and projects. Improving grant accounting processes will provide grant administrators with more accurate and timely data on grant budgets and expenditures. This will help administrators to better control costs and assess grantee performance. Coincident with grants improvements, NASA also will take steps to improve the rate at which completed grants and other contracts are closed out. Closing out grants and contracts more timely will help the Agency reduce administrative costs and better allocate any remaining funds to on-going efforts.

Financial reporting activities that were initiated in FY 2008 will be carried forward into FY 2009. These efforts have emphasized the importance and usefulness of financial reporting for NASA decision-makers, including its program and project communities. NASA will expand activities in FY 2009 to increase the relevant and actionable financial information provided to internal and external stakeholders.

Part 2: Detailed Performance Data

Performance System

NASA managers calculate ratings for multi-year Outcome and Annual Performance Goal (APG) performance based on a number of factors, including internal and external assessments.

Internally, NASA monitors and analyzes each program's adherence to budgets, schedules, and key milestones. These analyses are provided during monthly reviews at the Center, Mission Directorate, and Agency levels to communicate the health and performance of the program. Based on the ratings, managers formulate appropriate follow-up actions. (Program's are identified in NASA's annual budget estimates, available at http://www.nasa.gov/budget/.)

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 measures under Sub-goals 3A through 3D.

During the fiscal year, a third of the Agency's Themes also participate in the Office of Management and Budget's (OMB's) Program Assessment Rating Tool (PART) evaluation, which is a rigorous and interactive program assessment that involves both internal and external reviewers.

After weighing the input from various reviews for relevance, quality, and performance, NASA managers determine a program's progress toward achieving its respective multi-year and annual *Government Performance and Results Act* (GPRA) performance measures. NASA rates these 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, or the program did not have activities relevant to the APG during the fiscal year.

Other Trending Information

Blue	NASA exceeded (beyond a Green rating) performance expectations for this performance measure. NASA discontinued this rating as of FY 2005.
None	Although NASA may have conducted work in this area, management did not include a performance measure for this work in the fiscal year's performance plan.

8.3.1 Green	In prior years where data is available, NASA notes the applicable Outcome or APG reference number and rating to provide a Theme's performance trends. The annual Performance Report or Performance and Accountability Report for an indicated performance year provide the full text and explanations. In some cases, an Outcome or APG may track to more than one performance measure in past performance years.

PART Assessments

The PART assessments ask approximately 25 questions about a Theme's performance and management. Based on answers provided by the Theme, OMB applies a percentile score that yields the following ratings: Effective, Moderately Effective, Adequate, Ineffective, and Results Not Demonstrated. Summaries of all NASA PART ratings to date are provided in the following Strategic Goal and Cross-Agency Support Program write-ups. For more detailed information about a Theme's PART status and follow-up actions, please see the PART Status and Improvement Plans section of Part 4 or visit http://ExpectMore.gov.

Other Assessments

Discussions of other assessments, including the President's Management Agenda and Major Program Annual Report, relevant to the Agency's performance are available in the "Management and Performance" section of NASA's FY 2009 Budget Estimates, available at http://www.nasa.gov/budget.

Diagnostic Analysis of 2008 Program Performance Results

NASA regularly reports on cost, schedule, and mission success, along with a number of factors that contribute to project health such as acquisition processes, facility availability, and safety. NASA is performing an Agency-wide diagnostic analysis of these performance results, specifically targeting the Office of Management and Budget's Performance Assessment Rating Tool (PART) metrics, GPRA measures, and other cost and schedule reporting requirements. This activity will enable comprehensive trend analysis and provide detailed information on the root cause of performance results.

As an initial step toward this Agency-wide diagnostic analysis, NASA is developing definitions and categories for typical causes that impact mission performance. These categories will include external factors such as changes in Agency partnerships and acts of nature, along with internal factors such as contract and project management. NASA will assess the root causes at a level of fidelity necessary to provide a comprehensive understanding of performance results.

NASA will use these categories and definitions, along with the results of evaluation studies, investigations, and audits to better understand program and project performance. This diagnostic analysis will enhance comprehensive reviews of the Agency's portfolio, provide additional insight into PART, GPRA, and other measures of Agency performance, and suggest actions to improve performance.

The Agency anticipates initial diagnostic analysis results in time for the FY 2009 Performance and Accountability Report.

FY 2008 Expenditures Toward Strategic Goals

Although NASA allocates budgets and tracks costs for each of the Mission Directorates, the Agency also analyzes its expenditures for pursuing each of its Strategic Goals and Sub-goals. These expenditures are provided in the introduction table for each Strategic Goal and Sub-goal, and a full description of how NASA derives these expenditures are available in the Financial Overview section of Part 1.

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

	Green	Yellow	Red	White
2 Outcomes	2	0	0	0
4 APGs	3	1	0	0

Expenditures (In Millions of Dollars)
$4,227

Responsible Mission Directorate

Space Operations (SOMD)

Contributing Theme

Space Shuttle

Theme Description

The Space Shuttle Theme manages the Space Shuttle, currently the only U.S. launch capability providing 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.

PART Assessment Rating						
Theme	Last Year Assessed	Overall Rating	Program Purpose and Design	Strategic Planning	Program Management	Program Results/ Accountability
Space Shuttle	2005	Adequate	100%	89%	50%	33%

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 ISS. As required by Strategic Goal 1, NASA will retire the Space Shuttle fleet by 2010, making way for the new generation of launch and crew exploration vehicles being developed under Strategic Goal 4. 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.

Benefits

The Space 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 has inspired generations of schoolchildren to pursue dreams and careers in science, technology, engineering, and mathematics. The 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 Space Shuttle is the only vehicle capable of completing assembly of the ISS in a manner consistent with NASA's International Partner commitments and exploration research needs. The remaining Space Shuttle flights will be dedicated to ISS construction and a Hubble Space Telescope servicing mission.

A primary public benefit of retiring the Space Shuttle is to redirect resources toward new programs, such as the Orion Crew Exploration Vehicle and the Ares launch vehicles being developed by the Constellation Systems Theme, needed to send humans to the Moon and beyond. NASA will use the knowledge and assets developed over nearly three decades of Space Shuttle operations to build a new generation of vehicles designed for missions beyond low Earth orbit. As the Space Shuttle fleet approaches its retirement year, the Agency gradually is directing key Space Shuttle personnel, assets, and knowledge toward the development and support of new hardware and technologies that will support Constellation vehicles. For the American public, this means continuity in the access to space and sustained U.S. leadership in technology development and civilian space exploration.

Risks to Achieving Strategic Goal 1

The Space Shuttle Program faces two main challenges. First, NASA must maintain the skilled workforce and critical assets needed to safely complete the Space Shuttle manifest. Second, NASA must manage the process of retiring the Shuttle and transitioning and dispositioning Space Shuttle assets and capabilities when they are no longer needed for safe mission execution of the Shuttle or Constellation Programs.

The Space Shuttle transition and retirement effort is one of the largest that the Agency has undertaken in its history. The program's assets are significant; the program occupies over 640 facilities, uses over 990,000 line items of hardware and equipment, and employs over 1,600 civil servants, with more than 13,000 work-year equivalents employed by the prime contractors. In addition, the program employs over 3,000 additional indirect workers through Center general and administrative and service accounts. The total equipment acquisition value is over $12 billion, spread across hundreds of locations. The total facilities replacement cost is approximately $5.7 billion, which accounts for approximately one-fourth of the value of the Agency's total facility inventory. The program has nearly 1,200 active suppliers located throughout the country.

Because of the size, complexity, and dispersion of the program's assets, transition and retirement will require careful planning so as to not interfere with safe mission execution and not greatly impact other Agency activities. In addition to the sheer size of asset disposition activities, the Agency must cost-effectively manage and protect those Space Shuttle capabilities that are needed to satisfy the Agency's Strategic Goal of completing assembly of the ISS by the end of FY 2010 during the remaining scheduled flights. As ISS assembly is completed and the Space Shuttle Program's mission comes to a close, Constellation development activities will continue to ramp up. Use of certain legacy capabilities can reduce the time and resources necessary to achieve initial operational capability of the new designs. The SSP plays a key role in coordinating the smooth transition from current Space Shuttle operations to Constellation, thereby enabling new U.S. human spaceflight capabilities that will extend exploration and permanent human presence beyond low Earth orbit to the Moon, Mars, and beyond.

FY 2009 Performance Forecast

- As of September 2008, the Space Shuttle is manifested to fly a total of five missions to the ISS in FY 2009.
- The Space Shuttle Program has a number of major transition milestones set for FY 2009, including the first flight test of Ares 1 hardware (Ares-1-X) and the delivery of the last Space Shuttle main engine.

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

FY05	FY06	FY07	FY 2008
6.1 Green	1.1 Yellow	1.1 Green	Green

NASA's Space Shuttle Program continued a string of ISS assembly missions in FY 2008. In October 2007, the STS-120 mission delivered the Harmony node to the ISS, providing additional room for the ISS crew, a new location for vehicles to dock, and an anchor point to which the next set of international partner science labs could be attached. In February 2008, STS-122 delivered and integrated the European Space Agency's Columbus science module to the ISS. The STS-123 mission in March 2008 delivered the Canadian Dextre robotic system, as well as the first element of the Japanese contribution to the station, the Kibo Logistics Module. In May 2008 Space Shuttle Discovery and the STS-124 crew carried the largest single piece of the ISS to orbit, the Japanese Kibo pressurized science module. With Columbus and Kibo, the Space Shuttle has established Europe and Japan's first permanent foothold in low Earth orbit, setting the stage for the beginning of intense international use of the ISS and paving the way for future international cooperation in exploring the Moon, Mars, and beyond.

For the remainder of FY 2008, NASA focused on the development of two vehicles in preparation for the SM4 servicing mission to the Hubble. This mission has been postponed to 2009 in order to make preparations for repairing the science and communication systems on board the telescope. As NASA remains focused on the safe execution of these critical missions, the Agency also moved forward with plans for retiring the Space Shuttle in 2010. Significant milestones included starting to build the last Space Shuttle external tank and main engine, and identifying facilities, hardware, and people to be shared with the maturing Constellation Program.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Achieve zero Type-A (damage to property at least $1 million or death) or Type-B (damage to property at least $250 thousand or permanent disability or hospitalization of 3 or more persons) mishaps in FY 2008.	5SSP1 Green	6SSP1 Red	7SSP1 Green	**8SSP01 Green**
Complete 100 percent of all mission objectives for all Space Shuttle missions in FY 2008 as specified in the Flight Requirements Document for each mission.	None	None	7SSP2 Green	**8SSP02 Green**

Outcome 1.2: By September 30, 2010, retire the Space Shuttle.

FY05	FY06	FY07	FY 2008
None	None	Green	**Green**

NASA continues to plan for the retirement of the Space Shuttle in 2010. This year NASA worked on manufacturing the last Space Shuttle external tank and main engine. The Space Shuttle Program, working with the Constellation, identified and began sharing facilities, hardware, and people with Constellation. In February 2008, NASA published the Space Shuttle Programmatic Environmental Assessment, which addressed the potential environmental impacts associated with the transition and retirement of Space Shuttle Program property and assets. NASA has issued a Finding of No Significant Impact with respect to the disposition of program real and personal property. The assessment is available online at http://www.nasa.gov/mission_pages/shuttle/main/pea.html. NASA also completed the NASA Workforce Transition Strategy Initial Report (see Strategic Goal 4 for more details). The report is available online at http://www.nasa.gov/mission_pages/transition/home/initial_strategy_report.html.

FY 2008 Annual Performance Goal	FY05	FY06	FY07	FY 2008
Develop a detailed schedule of last-need dates for all significant Space Shuttle program element capabilities.	None	None	None	**8SSP03 Green**
A 9 percent reduction (over FY 2007 values) in the annual value of Shuttle production contracts for Orbiter, External Tank, Solid Rocket Boosters, Reusable Solid Rocket Motor, Space Shuttle Main Engine and Launch & Landing, while maintaining safe flight.	None	None	None	**8SSP04 Yellow**

Why NASA did not achieve APG 8SSP04: Production and hardware recycling contracts for external tank, main engine, and ground operations processing workforce needed to be maintained longer than anticipated to support the five flights per year now planned for FY 2009 and FY 2010.

Plans for achieving 8SSP04: The Space Shuttle Program will continue to allocate resources in a manner that ensures the safe flyout of the manifest.

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

	Green	Yellow	Red	White
3 Outcomes	3	0	0	0
9 APGs	9	0	0	0

Expenditures (In Millions of Dollars)
$2,265

Responsible Mission Directorate

Exploration Systems (ESMD)

Space Operations (SOMD)

Contributing Theme

Advanced Capabilities

International Space Station (ISS)

Theme Description

The Advanced Capabilities Theme provides knowledge, technology, and innovation that will enable current and future exploration missions, as outlined in NASA's Strategic Plan. The Advanced Capabilities programs and their projects provide knowledge as a result of ground based research and technology development, research conducted in space, and observations from robotic flight missions. Advanced Capabilities also develops and matures advanced technology, integrates that technology into prototype systems, and transitions knowledge and technology to the Constellation Program.

The ISS Theme manages ISS launch processing activities, on-orbit assembly and maintenance, and research payload and experiment delivery to orbit. The program works with NASA's International Partners to maintain and improve ISS capabilities such as appropriate crew presence and available facilities.

PART Assessment Rating

Theme	Last Year Assessed	Overall Rating	Program Purpose and Design	Strategic Planning	Program Management	Program Results/ Accountability
International Space Station	2008	Effective	100%	100%	88%	80%
Advanced Capabilities	2007	Adequate	100%	90%	75%	45%

Built and operated using state of the art science and technology, the ISS—and by extension Strategic Goal 2—is a vital part of NASA's program of exploration. As of October 2008, the ISS is more than 75 percent complete. The ISS provides an environment for developing, testing, and validating the next generation of technologies and processes needed to support Sub-goal 3F, Strategic Goal 4, and NASA's objective to return to the Moon and send human explorers deeper into space.

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 into 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—these are capabilities critical to future missions beyond low Earth orbit.

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

Risks to Achieving Strategic Goal 2

The primary risks to Strategic Goal 2 are: the Space Shuttle Program's ability to complete the ISS manifest and to successfully complete assembly operations; the ability of the ISS Program to acquire the necessary spares to be launched on the Space Shuttle before retirement; and delivery and operability of the systems that support the six crew capability.

FY 2009 Performance Forecast

- In FY 2009, NASA will continue ISS assembly and complete the truss and solar array assembly with delivery of the S6 truss structure on Flight 15A. The final Japanese Aerospace Exploration Agency's (JAXA) segments, Exposed Facility and the Experimental Logistics Module-Exposed Section will be delivered on Flight 2J/A. Flight 17A will perform resupply with a Multi-Purpose Logistics Module. Flight ULF3 is scheduled for the delivery of the ExPRESS Logistics Carriers 1 and 2.
- ISS will continue processing activities, ground testing, and integration of flight hardware for future missions, while operating and monitoring the health of the vehicle systems, and conducting operations on 30 to 40 research experiments. Ground training is ongoing for future flight crews, and ISS will continue to conduct ISS-based spacewalks for ISS maintenance, science, and assembly.

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.

FY05	FY06	FY07	FY 2008
8.1 Green 8.2 Green	2.1 Green	2.1 Green	**Green**

NASA is on schedule to complete ISS assembly by 2010. This was a banner year for the ISS International Partners, with NASA's Space Shuttle Program launching four International Partner elements. In February Space Shuttle and ISS crewmembers added the European Space Agency's (ESA) Columbus module laboratory. In March, ESA launched and docked the first Automated Transfer Vehicle, a robotic vehicle to resupply and reboost the ISS. In March, JAXA added the Kibo logistics module, augmented by the Kibo laboratory module in April. In addition, NASA launched Dextre, a two-armed robot built by the Canadian Space Agency (CSA) designed to work outside of the ISS. Resupply missions, crew rotation missions, and numerous spacewalks were all successful. Of note, ISS crews performed spacewalks to repair a torn solar array and to replace a Beta Gimbal Assembly motor. The Beta Gimbal Assemblies transfer electrical power across the joints holding the large solar arrays and rotate the arrays towards the Sun. In July, two ISS Russian crewmembers performed spacewalks to inspect and remove a Soyuz pyro bolt in support of the ongoing investigation on two Soyuz ballistic entries. In November, the ISS Program plans to restore functionality to the Starboard Solar Array Rotary Joint (SARJ), which is experiencing rotation problems. ISS crewmembers will clean, lubricate and replace trundle-bearing assemblies on the Starboard SARJ.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Based on the actual Space Shuttle flight rate, number of remaining Shuttle flights, and the discussions with the International Partners, update the agreed-to ISS assembly sequence and transportation plan as necessary.	5ISS3 Green	None	7ISS1 Green	**8ISS01 Green**
Accomplish a minimum of 90 percent of the on-orbit research objectives as established one month prior to a given increment.	5ISS4 Yellow	6ISS3 Yellow	7ISS2 Green	**8ISS02 Green**
Per the final configuration agreed to by the International Partners, fly the ISS elements and logistics baselined for FY2008.	5ISS5 Yellow	6ISS1 Green	7ISS3 Green	**8ISS03 Green**
Provide increased power capability by assembling the remaining Truss element as baselined in FY2008	None	None	None	**8ISS04 Green**

Outcome 2.2: By 2009, provide the on-orbit capability to support an ISS crew of six crewmembers.

FY05	FY06	FY07	FY 2008
None	None	2.2 Green	**Green**

The ISS Program has achieved over seven years of continuous crewed operations and completed the assembly of the core U.S. on-orbit segment. The elements that form the living spaces and laboratories are in place, and now NASA is focusing on installing new support systems. The program is on track to achieve its planned six-crew capability with the use of seven major pieces of hardware, including the Carbon Dioxide Removal Assembly and the Oxygen Generator System, which are already on the ISS. The Water Recovery System, the Total Organic Carbon Analyzer, the Waste Hygiene Compartment, Advanced Resistive Exercise Device, and the Potable Water Dispenser are scheduled to be launched in November 2008 on ULF-2.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Establish flight-ready status for the Water Recovery System (part of the U.S. Regenerative Environmental Control Life Support System).	None	None	7ISS4 Green	**8ISS05 Green**
In concert with the International Partners, assure a continuous crew presence on the ISS.	5ISS6 Green	None	7ISS5 Green	**8ISS06 Green**

Outcome 2.3: Conduct basic and applied biological and physical research to advance and sustain U.S. scientific expertise.

FY05	FY06	FY07	FY 2008
None	None	None	**Green**

NASA exceeded its target of conducting two experiments aboard the ISS, launching five experiments: two experiments on Microbial Drug Resistance and Virulence (MDRV) to study the mechanisms of infection potential in microbial cultures and evaluate microbial drug resistance; a U.S.-Russian collaborative experiment on the Optimization of Root Zone Substrates (ORZS) to develop and optimize hardware for growing plants in microgravity; Investigating the Structure of Paramagnetic Aggregates from Colloidal Emulsions-2 (InSPACE-2) to investigate a pattern of dynamic instabilities revealed in fluids that change properties in response to magnetic fields; the Coarsening in Solid-Liquid Mixtures-2 (CSLM-2) experiment defines the mechanisms and rates of coarsening in the absence of gravitational settling; and the Shear History Extensional Rheology Experiment (SHERE) to study the effect of rotation on the stress and strain response of a polymer fluid being stretched in microgravity. The ISS Research Project supported 40 peer-reviewed research investigations covering the disciplines of combustion science, fluid physics, materials science, and life sciences. The project has opened solicitations for new investigators for the Physical Sciences and Life Sciences Programs. The selections and awarding of new research grants will take place in early FY 2009.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Design, build, and deliver for flight two ISS experiments.	None	None	None	**8AC01 Green**
Design, build, and deliver for flight two Foton M3 experiments.	None	None	None	**8AC02 Green**
Conduct 30 ground-based investigations in the physical and biological sciences that promote the development of related microgravity research capabilities.	None	None	None	**8AC03 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.

NASA divided Strategic Goal 3 into a series of Strategic Sub-goals to adequately address the broad range of activities covered by the goal. All of the performance measures (multi-year Outcomes and APGs) associated with Strategic Goal 3 can be found under Sub-goals 3A through 3F.

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

	Green	Yellow	Red	White
7 Outcomes	6	1	0	0
10 APGs	10	4	0	0

Expenditures (In Millions of Dollars)
$1,584

Responsible Mission Directorate

Science

Contributing Theme

Earth Science

Theme Description

The Earth Science Theme conducts research and technology development to advance Earth observations from space, improve understanding of the Earth system, and demonstrate new remote sensing science and technologies for future operational systems.

PART Assessment Rating

Theme	Last Year Assessed	Overall Rating	Program Purpose and Design	Strategic Planning	Program Management	Program Results/ Accountability
Earth Science	2008	Moderately Effective	100%	100%	83%	72%

Note: NASA divided the Earth–Sun System Theme into two Themes as of the FY 2008 Budget Estimates. Earth Science is responsible for Sub-goal 3A and Heliophysics is responsible for Sub-goal 3B.

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 regionally significant and pose immediate hazards to humans. Other changes, like climate variability, are revealed through long-term observations and modeling. To achieve Sub-goal 3A, NASA's Earth Science programs help 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.

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 Climate Change Science Strategic Plan (July 24, 2003) with special emphasis on global observations; and
- The U.S. Ocean Action Plan, released in 2004, as part of an 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 its partners—other government agencies, academia, non-profit organizations, industry, and international organizations—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 programs also help NASA achieve the Agency's other Strategic Goals and overall Mission:

- Earth observing satellites provide meteorological information used by NASA, the National Oceanic and Atmospheric Administration (NOAA) and the Department of Defense in providing weather forecasts that are used to fulfill their Agency mandates.
- Measurement and analysis techniques, demonstrated first in Earth orbit and applied first to Earth studies, may help advance exploration and understanding of other planets in the solar system.

Risks to Achieving Sub-goal 3A

With the re-manifestation of a number of climate sensors onto NPOESS and the initiation of several National Research Council-recommended Decadal Survey missions, NASA is making significant strides towards achieving its overarching Earth and climate science goals. Even with these positive steps, however, there remain risks of gaps in important long-term climate-related data records started by the Landsat and Earth Observing System (EOS) programs due to delays in the start of the LDCM project and the development of the NPP project. In addition, phasing of new funds for the ICESat follow-on mission carry a risk of a data gap between ICESat and the follow-on mission.

FY 2009 Performance Forecast

- The Science Mission Directorate will issue Research Opportunities in Space and Earth Science in 2009 (ROSES-09), a research announcement covering all of the planned research solicitations in Earth Science Research for FY 2009.
- The OCO and Glory missions are scheduled to launch and begin operations in FY 2009. The GPM mission is scheduled for Confirmation Review, and the LDCM spacecraft will complete its Critical Design Review.
- Each operating spacecraft in the Earth Systematic Mission program no longer in prime mission phase will be evaluated as part of the biennial Senior Review to determine potential extensions and modifications to their mission implementation plans.
- The Earth Science Multi-Mission Operations program will continue the operation of the Earth Observing System Data and Information System (EOSDIS), which develops data products through its Core Systems Science Data Processing Systems and manages and distributes data products through the Distributed Active Archive Centers. The maintenance of these systems is important to the collection of data from Earth Science satellites in orbit, as well as to the continuity of Earth Science research efforts.
- The Earth Science Technology program will plan and implement development of new remote-sensing and information systems technologies for infusion into future science missions in order to enable, or dramatically enhance, measurements and data system capabilities.
- For 2009, the Applied Science Program will continue to work across the range of applicable areas focusing on mitigating and adapting to climate variability and change, and protecting and monitoring our coastal communities.

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 05	FY 06	FY 07	FY 2008
None	3A.1 Green	3A.1 Green	**Green**

Improvements in satellite sensors allow scientists to track pollution sources and assess how these sources contribute to air quality around the world. In 2008, researchers announced the first measurement-based estimate of pollution transport from East Asian forest fires, urban exhaust, and industrial production to the North American continent. Satellite data confirmed that 18 teragrams—almost 40 billion pounds—of pollution aerosols were exported from Asia to the Northwestern Pacific Ocean and 4.5 teragrams—nearly 10 billion pounds—reached North America. Satellite data also have given scientists new insights into local source regions of pollution, diurnal cycles of pollutants, and the transport of pollutants in convective systems, the transfer of energy between Earth's surface to the atmosphere that contributes to both regional weather and global climate changes.

NASA continues to investigate dynamics in Earth's atmospheric composition. Recent satellite and aircraft observations coupled with advanced chemical-transport models have advanced scientists' understanding of the short- and long-term variability in the ozone layer caused by natural effects (e.g., weather, volcanoes, and the solar cycle), human-made sources of ozone destroying gases such as chlorine and bromine, and changes in the climate caused by greenhouse gases. The

Ozone Monitoring Instrument and Microwave Limb Sounder on the Aura satellite has contributed data that suggests chlorine levels are dropping. This supports the prediction that the Antarctic ozone hole will be fully recovered around 2070. However, the models are being challenged with new findings based on data from NASA's ER-2 aircraft that revise the atmospheric lifetime of chlorofluorocarbon 11 and laboratory measurements of a key chemical process in polar ozone loss involving chlorine monoxide.

NASA has made progress in measuring and modeling how aerosols can contribute to climate forcing, or changes in the climate. The Moderate Resolution Imaging Spectroradiometer (MODIS) Collection 5, a reprocessing of five years of data collected from the MODIS instruments aboard the Terra and Aqua satellites, has provided improved tracking and detection of aerosol over land. NASA's reprocessing of the entire Multi-angle Imaging Spectroradiometer aerosol data set gathered by the EOS and Terra satellites provide critical information for trend assessments. This satellite data, along with improved computer modeling, has helped scientists better understand aerosol-driven redistribution of heat in the atmosphere (so-called "heat pumps"), the impact of transported dust on sea-surface temperatures and the creation of tropical storms, and the global distribution of aerosol sources.

FY 2008 Annual Performance Goal	FY05	FY06	FY07	FY 2008
Demonstrate progress in understanding and improving predictive capability for changes in the ozone layer, climate forcing, and air quality associated with changes in atmospheric composition, based on measurements from presently orbiting NASA and non-NASA assets. Progress will be evaluated by external expert review.	None	6ESS7 Green	7ESS1 Green	**8ES01 Green**

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

FY05	FY06	FY07	FY 2008
None	3A.2 Green	3A.2 Green	**Green**

NASA's Earth science research missions continue to collect data and improve models for predicting local weather. These predictive capabilities improve weekly forecasts and increase valuable warning time in the event of extreme weather. The ground-based North Alabama Lighting Mapping Array (NALMA), an array of radio receivers that detect, triangulate and measure total lightning strikes, provide additional warning time for severe weather. NALMA also functions as a prototype for the Geostationary Lightning Mapper (GLM) mission, an instrument designed for NOAA's next-generation GOES-R satellite. Like NALMA, GLM will provide advance warning of severe weather, but over a much larger portion of the globe.

NASA's Short-term Prediction Research and Transition (SPoRT) Center is using composite data to improve short-term (i.e., two-day) weather forecasting. The Center combined high-resolution MODIS data with sea surface temperature data to improve coastal weather forecasting. This new technique eliminates unusable data from cloudy areas, improving the overall data quality on partly cloudy days.

FY 2008 Annual Performance Goal	FY05	FY06	FY07	FY 2008
Demonstrate progress in enabling improved predictive capability for weather and extreme weather events. Progress will be evaluated by external expert review.	None	6ESS7 Green	7ESS2 Green	**8ES02 Green**

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

FY05	FY06	FY07	FY 2008
None	3A.3 Green	3A.3 Green	**Green**

NASA research has shown advances in documenting land cover change and its causes and consequences around the world. Ocean studies have gathered data on aquatic productivity and carbon dynamics, including studies of responses to climate change. Scientists used new satellite data and modeling tools to produce biomass maps for North America and Russia,

quantifying changes on terrestrial productivity and regional carbon storage. Results from these studies show changes in land use connected to logging and fire in North America, socioeconomic and political changes in Eastern Europe, and increases in demand for soybeans and beef in the Amazon.

NASA conducted research in the Southern Ocean, also known as the South Polar Ocean, to collect data to improve satellite estimates of regional phytoplankton chlorophyll content and productivity, as well as carbon dioxide uptake by the ocean on a broad spatial scale. Analysis of satellite readings of sea ice cover and productivity showed an increase in productivity in the Arctic Ocean. This increase should enhance the growth between the ocean and its bottom, causing greater resource availability to organisms. In the Gulf of Maine, scientists linked the production of calcium carbonate by phytoplankton with primary production, the energy produced by photosynthesis, allowing for estimates of calcification and its effects on ocean carbon dynamics from space.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Demonstrate progress in quantifying global land cover change and terrestrial and marine productivity, and in improving carbon cycle and ecosystem models. Progress will be evaluated by external expert review.	None	6ESS7 Green	7ESS3 Green	**8ES03 Green**
Complete the Orbiting Carbon Observatory (OCO) Operational Readiness Review.	None	None	7ESS6 Yellow	**8ES04 Yellow**

Why NASA did not achieve APG 8ES04: The OCO mission Operational Readiness Review (ORR) was originally scheduled to occur in June 2008, two months before the planned August 2008 launch readiness date (LRD). Due to delays in the OCO instrument development—persistent schedule delays with the instrument manufacturer caused project management at the Jet Propulsion Laboratory to transfer a significant amount of instrument work in-house—the project was rebaselined in April 2007, extending the LRD by three months to December 2008. Consequently, the ORR slipped to September 2008. In May 2008, the launch of OCO was delayed by one month, due to launch site availability. This shifted the ORR date again, moving it to November 2008.

Plans for achieving APG 8ES04: NASA completed the ORR in November 2008.

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.

FY05	FY06	FY07	FY 2008
None	3A.4 Yellow	3A.4 Green	**Green**

NASA-sponsored research in the analysis of satellite observations is providing new and refined estimates of numerous water cycle variables, especially at regional scales. In particular, researchers have combined data from the GRACE satellite with other data sources to estimate the freshwater flux into the Pan-Arctic basin, where previous gauge-based estimates have not been consistently reliable. Researchers have developed improved estimates of water cycle variables (such as evaporation) in other regional and river basins by combining data from GRACE and from MODIS with high-resolution land surface models. Researchers also have used data from NASA satellites to reduce the uncertainties associated with key global energy budget parameters that affect water cycle variables, such as land and ocean surface evaporation.

Interferometric synthetic aperture radar (SAR) measurements provided the first-ever water surface elevation measurements of the Amazon flood wave as it moves across the vast floodplain. These measurements allowed for a better understanding of the hydraulics of water flow into the floodplain, how long it resides there, and how it decants from the vast wetlands. Such measurements are critical to building correct hydrodynamic models of floods, not only for the Amazon but for any environment shaped by rivers and streams and their associated processes.

FY 2008 Annual Performance Goal	FY05	FY06	FY07	FY 2008
Demonstrate 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. Progress will be evaluated by external expert review.	None	6ESS7 Green	7ESS5 Green	**8ES05 Green**
Complete Global Precipitation Measurement (GPM) Mission Spacecraft Preliminary Design Review (PDR)	None	None	None	**8ES06 Yellow**

Why NASA did not achieve APG 8ES06: NASA has rescheduled the GPM spacecraft PDR for FY 2009 to accommodate a revised funding plan.

Plans for achieving 8ES06: NASA will conduct the sspacecraft PDR with the mission-level PDR, which is scheduled to occur in the first quarter of FY 2009. This change was made to accommodate a slower Goddard Space Flight Center in-house staffing ramp-up in FY 2009 without impacting the 2013 core spacecraft launch readiness date.

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.

FY05	FY06	FY07	FY 2008
None	3A.5 Yellow	3A.6 Yellow	**Yellow**

NASA has seen changes in Arctic ice sheets and sea ice, including a decrease in the sea ice thickness and area during springtime. The observation has helped scientists develop ice models that forecast further declines in sea ice area in winter 2008. NASA observation also saw large outflow from a lake on the surface of the Greenland ice sheet that, for a one-hour period, exceeded the flow over Niagara Falls. This observation combined with measurements of increased ice speed provided new insight into the effect of bed lubrication by lake drainage on ice movement.

Continuing observations of ocean surface height, wind speed, and direction have allowed scientists to analyze trends of sea levels and the Atlantic Meridional Overturning Circulation, and have improved calculations for the transfer of energy from the winds into the ocean. Analysis of ocean data sets has provided the basis for improved understanding of ocean circulation. In this view, eddy-driven stationary zonal currents, rather than planetary wave-driven, large-scale gyres (swirling vortices caused by Earth's Coriolis Effect), drive ocean circulation away from land boundaries.

Increased understanding of ice sheets and atmospheric-ocean processes is informing model studies and predictions. For instance, a new NASA-led study shows that human-caused climate change has impacted a wide range of Earth's natural systems, from permafrost thawing to plants blooming earlier across Europe to lakes declining in productivity in Africa. New model studies are predicting such future trends as a slight decrease in global aerosol amounts that will result in a change from the global "dimming" observed over the past several decades to a global "brightening." Recent model studies are also predicting that future U.S. heat waves are likely to become more severe and that the occurrence and intensity of lightning storms and severe thunderstorms will become more frequent and intense.

Why NASA is not on track to achieve Outcome 3A.5: Performance toward this Outcome continues to be a concern due to uncertainties in climate data continuity and delays and technical issues related to the NPP mission. In particular, the NPOESS-developed Visible/Infrared Imager/Radiometer Suite (VIIRS) instrument continues to present significant development challenges, and NASA already knows that its performance will not meet all NPP Level-1 requirements and, therefore, will impact key climate research measurements of ocean color and atmospheric aerosols. VIIRS performance issues have been causing cost and schedule overruns, which impact not only the timely implementation of the systematic Earth observation missions, but the overall success of the flight program.

Plans for achieving 3A.5: In addition to previous contractor management changes approved by the Tri-Agency (NOAA, Department of Defense, NASA) Executive Committee and implemented by the Integrated Program Office (IPO) on NPOESS, NASA is supplying key quality assurance personnel to support IPO technical management personnel in accelerating the completion of the VIIRS instrument. NASA also is undertaking a comprehensive analysis of science community requirements unlikely to be met by VIIRS as an initial step in devising a mitigation strategy.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Demonstrate progress in understanding the role of oceans, atmosphere, and ice in the climate system and in improving predictive capability for its future evolution. Progress will be evaluated by external expert review.	None	6ESS7 Green	7ESS7 Green	**8ES07 Green**
Launch the Ocean Surface Topography Mission (OSTM).	None	None	7ESS9 Green	**8ES08 Green**
Complete the Glory mission Operational Readiness Review (ORR).	None	None	7ESS8 Yellow	**8ES09 Yellow**

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Complete the Aquarius Instrument Pre-ship Review.	None	None	None	**8ES10 Yellow**

Why NASA did not achieve APG 8ES09: Challenges on developing the Aerosol Polarimetry Sensor (APS) instrument delayed the ORR. NASA rebaselined the Glory project in April 2008 to accommodate the late completion of the APS instrument, establishing a June 2009 LRD.

Plans for achieving APG 8ES09: The ORR is scheduled to occur in early 2009.

Why NASA did not achieve APG 8ES10: The Aquarius Instrument Pre-Ship Review was originally scheduled to occur in May 2008. However, due to schedule slips by NASA's foreign partner CONAE (Comisión Nacional de Actividades Espaciales, the Argentinean space agency) on the spacecraft development, NASA rebaselined the project first in November 2006 and then again in November 2007. These rebaselines delayed the Pre-Ship Review and delayed the launch a total of 14 months.

Plans for achieving 8ES10: The Instrument Pre-Ship Review is currently scheduled for mid-2009.

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

FY05	FY06	FY07	FY 2008
None	3A.6 Green	3A.6 Green	**Green**

Scientists characterized mass movements during the 2004 Sumatra-Andaman earthquake using gravity data from NASA's GRACE satellite. This underwater earthquake, caused by subduction (where one tectonic plate slides under another), triggered tsunamis along the coast of most of the countries bordering the Indian Ocean, killing more than 225,000 people. Scientists found that the earthquake changed Earth's gravity in ways that could be detected by GRACE and GPS.

Research on tsunamis suggests that horizontal faulting motions (where tectonic plates move parallel to each other) play a larger role in tsunami generation than previously believed. These findings have produced a method to improve tsunami warning systems, and a new theory on the source of the December 2004 Indian Ocean tsunami.

Scientists have found that combining measurements made with a 5-hertz GPS instrument with normal GPS measurements and diagnostics may enable coseismic slip (movement that occurs simultaneously around the area of an earthquake) imaging of subduction zones. The GPS units normally used for automobile navigation have a refresh rate of 1-hertz. Faster refresh rates such as 5-hertz offer a finer degree of measurement and reduce lag time in data. By combining the two types of measurements, scientists obtain a better understanding of the mechanics of an earthquake cycle.

Gravitational field variability, as observed by GRACE, is helping scientists understand regional mass flux, especially in areas where water remains frozen (called the cryosphere). Recent analysis of mass balance in the Gulf of Alaska showed both the trend of glacier mass loss, and the seasonal and interannual variability. Scientists also calculated the surface change for many Greenland and Himalayan glaciers using current ASTER (an imaging instrument flying aboard the Terra satellite) data, historic Landsat data, and photography. Analysis of the glacier data revealed that most of the observed glaciers have retreated significantly in the past decade.

NASA's L-Band Uninhabited Aerial Vehicle Synthetic Aperture Radar (UAVSAR), which is under development to measure surface change at high spatial and temporal resolution, has demonstrated the ability to measure millimeter-scale changes in glacial advance within the Mt. St. Helens crater. The UAVSAR also detected changes in land surface deformation due to soil expansion from agricultural irrigation practices.

FY 2008 Annual Performance Goal	FY05	FY06	FY07	FY 2008
Demonstrate progress in characterizing and understanding Earth surface changes and variability of Earth's gravitational and magnetic fields. Progress will be evaluated by external expert review.	None	6ESS7 Green	7ESS10 Green	**8ES11 Green**

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

FY 05	FY 06	FY 07	FY 2008
None	3A.7 Green	3A.7 Green	**Green**

The Applied Sciences Program identifies and demonstrates uses of NASA Earth science research and observations to assist decision makers, such as water managers, land use planners, public health officials, and disaster managers and responders in their work. The Applied Sciences Program began a number of new efforts to enhance its performance, including the development of an initiative on coastal management issues in the Gulf of Mexico. The program has created a focus on decision-making for climate change and has broadened the scope of its solicitations from demonstration projects only to include feasibility studies and regional projects. The program is also developing a five-year program plan that emphasizes decision-support needs for climate change, applications-oriented data management issues and products, and involvement in satellite mission teams.

In FY 2008, the program's SERVIR (Spanish for "to serve") Regional Monitoring and Visualization System project won national and international awards. The project uses a satellite visualization system to provide real-time environmental monitoring in Central America. At a glance, decisions-makers can track weather, forest fires, and other environmental challenges. SERVIR supports the 10-year plan for implementation of the Global Earth Observation System of Systems (GEOSS), which was adopted by the European Commission and over 70 governments worldwide. This fiscal year, the project expanded its services to include Africa. For more information on SERVIR, visit http://www.nasa.gov/mission_pages/servir/index.html.

In addition, NASA's Wildfire Research and Applications Partnership (WRAP) project, together with the Ikhana unmanned aerial vehicle, played a vital role in managing and fighting the recent wildfires in California. Fitted with the NASA-developed Autonomous Modular Sensor, the Ikhana collected real-time visible light, infrared, and thermal imagery, allowing emergency response personnel to see through the smoke and monitor and predict the fires' behavior. The Ikhana transmitted the imagery through a communications satellite to the Ames Research Center, where researchers superimposed the information over maps of the terrain. The success of this effort was recognized by the Governor of California and the U.S. Secretary of Homeland Security. WRAP fosters collaborative partnerships between NASA and the U.S. Forest Service to demonstrate technologies like the Ikhana for increasing the information content and timeliness of Earth resource data collected for wildfires. Further information on WRAP is available at http://geo.arc.nasa.gov/sge/WRAP/. Images of the wildfires taken by Ikhana and NASA satellites are available at http://www.nasa.gov/topics/earth/features/fire_and_smoke.html.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Issue twelve reports with partnering organizations that validate that using NASA research capabilities (e.g., observations and/or forecast products) could improve their operational decision support systems.	None	None	7ESS11 Green	**8ES12 Green**
Increase the number of distinct users of NASA data and services.	None	6ESS5 Green	None	**8ES13 Green**
Maintain a high level of customer satisfaction, as measured by exceeding the most recently available federal government average rating of the Customer Satisfaction Index.	None	6ESS6 Yellow	None	**8ES14 Green**

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

	Green	Yellow	Red	White
3 Outcomes	3	0	0	0
6 APGs	6	0	1	0

Expenditures (In Millions of Dollars)
$1,021

Responsible Mission Directorate

Science (SMD)

Contributing Theme

Heliophysics

Theme Description

The Heliophysics Theme studies the science of the Sun-Solar System Connection to understand the Sun and its effects on Earth, the solar system, and the space environmental conditions that will be experienced by explorers, and to demonstrate technologies that can improve future operational systems.

PART Assessment Rating

Theme	Last Year Assessed	Overall Rating	Program Purpose and Design	Strategic Planning	Program Management	Program Results/ Accountability
Earth–Sun System	2005	Moderately Effective	100%	100%	84%	74%

Note: NASA divided the Earth–Sun System Theme into two Themes as of the FY 2008 Budget Estimates. Earth Science is responsible for Sub-goal 3A and Heliophysics is responsible for Sub-goal 3B.

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

To achieve Sub-goal 3B, Heliophysics Theme researchers study the Sun and its influence on the solar system as elements of a single, interconnected Earth–Sun system. A group of spacecraft that form an extended network of sensors allows researchers to investigate the magnetic Sun and its effect on the planets and the solar system. Using data from these spacecraft, NASA seeks to understand the fundamental physics behind Sun–planet interactions and study space environmental hazards.

Benefits

Society is increasingly dependent on technologies that are vulnerable to solar activity and space weather events, so the need to predict solar events and mitigate their effect is critical to the public's safety, security, and the Nation's economy.

This predictive capability is critical to NASA's human and robotic space missions as well. Better understanding and improved observations of solar events and of the science of heliophysics will provide the information needed to develop early warning systems and technologies that will protect astronauts, spacecraft, and the ground-based technology systems susceptible to space weather interferences and hazards.

Risks to Achieving Sub-goal 3B

Of primary cost concern for the Heliophysics Division is the reduction of Expendable Launch Vehicle (ELV) options. Over the course of the last decade, the Delta II has been the workhorse for SMD, its loss leaving only larger and costlier Evolved ELVs (e.g., the Delta IV and Atlas V) for many of the missions identified in the NASA Science Plan or much smaller launch vehicles with significantly reduced capabilities. NASA is aggressively exploring options to maintain a vital flight program.

The Ulysses, Polar, IMAGE, TIMED, and FAST missions have ceased operations after long mission lives or lost critical instruments. This means that critical data with which to gain knowledge about the end-to-end Sun to Earth connection is

absent. Specifically, continued observations of Earth's global current system that drives space weather are needed, along with cause-and-effect surveillance of Earth's polar magnetosphere. The discontinuation of Ulysses out-of-ecliptic measurements impedes progress on understanding the generation of solar winds and magnetic fields at the Sun's polar latitudes.

FY 2009 Performance Forecast

- The Research and Analysis Program will hold its annual competition for new research awards: approximately $9 million will be available for the competition, resulting in approximately 70 new awards.
- NASA will continue to execute space-based solar and space physics investigations and will hold its annual guest investigator competition.
- The Sounding Rockets Program will launch approximately 15 missions from domestic and international locations.
- Science Data and Computing Technology will hold its annual competition for the Applied Information Systems Research where approximately $2 million will be available for new research awards.
- NASA will complete development of the SDO mission, working towards launch in mid-FY 2009 or early FY 2010. SDO will image the Sun to study variations in solar irradiance that influence Earth's climate, how the solar magnetic field is structured and how its energy is converted and released into the heliosphere in the forms of solar wind and energetic particles.
- Heliophysics will complete formulation and start implementation for the MMS mission. MMS is a four-spacecraft mission to study magnetic reconnection in key boundary regions of Earth's magnetosphere, providing better understanding of this primary process by which energy is transferred from the solar wind to Earth's magnetosphere.
- Heliophysics will complete formulation and start implementation for the RBSP mission. RBSP is a two-spacecraft mission to investigate how populations of relativistic electrons and ions in space are formed or changed in response to the variable inputs of energy from the Sun.
- Heliophysics will achieve its mission success criteria for the STEREO, AIM, and THEMIS missions.

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.

FY05	FY06	FY07	FY 2008
15.4 Green	3B.1 Green	3B.1 Green	**Green**
15.5 Green			
15.6 Green			
15.7 Green			
15.8 Green			

On August 30, 2007, Voyager 2 made the first of several crossings of the solar wind termination shock and joined Voyager 1 in exploring the heliosheath, the turbulent region that separates the solar system from the local interstellar medium. Voyager 2 crossed at southern heliographic latitudes and found the location of the termination shock to be seven to eight AU (around 651 to 744 million miles) closer to the Sun than when Voyager 1 crossed the termination shock at northern latitudes in 2005. Studies released in 2008 state that this asymmetry may indicate that the local interstellar magnetic field presses the solar system inward more strongly in the south. The Voyager spacecraft are providing for the first time data gathered directly from the heliosheath, giving researchers new insight into the outer solar system and the interstellar medium beyond.

Although scientists have long known that Earth's magnetosphere and solar corona are extremely efficient accelerators of relativistic particles, the acceleration mechanisms are a source of controversy. Recent observations from several NASA satellites have confirmed the essential role that interactions between particles and electromagnetic waves play in accelerating particles to hazardous energies. In the magnetosphere, measurements by the two STEREO satellites revealed large-amplitude waves in the radiation belts that energize electrons to mega electron volt (MeV) energies in less than a tenth of a second. Scientists used simultaneous observations from multiple missions in the heliosphere to identify key elements of particle acceleration during solar storms. These elements include the origin, structure, and evolution of shock

fronts that propagate through the solar system, and the nature of the turbulence associated with these shocks. In the solar atmosphere, Hinode observations point to magnetic reconnection as the process through which the solar magnetic field fuels explosive particle acceleration events. These advances form part of the observational background needed to forecast the intensities and properties of energetic charged particles as they flow from the Sun through to the radiation environment they create near Earth.

The STEREO mission made valuable contributions to the understanding of comets. Observations of the extremely bright Comet McNaught revealed evidence of a dust tail consisting of neutral iron atoms pushed out by the pressure of sunlight in the first-ever detected neutral iron tail from a comet. STEREO also witnessed the collision between a coronal mass ejection and Comet Encke that resulted in a spectacular detachment of the comet's ion tail. The analysis suggests that the detachment may have been caused by the process of magnetic reconnection. Extended STEREO observations of Comet Loneos show that disruptions of comet tails are likely to be a frequent occurrence.

<table>
<tr><th>FY 2008 Annual Performance Goals</th><th>FY05</th><th>FY06</th><th>FY07</th><th>FY 2008</th></tr>
<tr><td rowspan="4">Demonstrate 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. Progress will be evaluated by external expert review.</td><td>5SEC9
Blue</td><td>6ESS11
Green</td><td rowspan="4">7ESS13
Green</td><td rowspan="4">8HE01
Green</td></tr>
<tr><td>None</td><td>6ESS12
Green</td></tr>
<tr><td>5SEC12
Blue</td><td>6ESS14
Green</td></tr>
<tr><td>5SEC13
Green</td><td>6ESS15
Green</td></tr>
<tr><td>Complete Magnetospheric MultiScale (MMS) System Design Review (SDR).</td><td>None</td><td>None</td><td>7ESS15
Red</td><td>8HE02
Green</td></tr>
</table>

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.

<table>
<tr><th>FY05</th><th>FY06</th><th>FY07</th><th>FY 2008</th></tr>
<tr><td>15.2
Green</td><td rowspan="2">3B.2
Green</td><td rowspan="2">3B.2
Green</td><td rowspan="2">Green</td></tr>
<tr><td>15.3
Green</td></tr>
</table>

NASA has made progress in understanding how Earth's magnetic field stores energy from the solar wind until it is released, producing substorms. Explosions of magnetic energy power substorms that cause sudden brightening and rapid movements of the aurora borealis, the Northern Lights. Researchers using the THEMIS satellites discovered that the reason for this is magnetic reconnection, a process that occurs throughout the universe when stressed magnetic field lines suddenly snap to a new shape, like a rubber band that's been stretched too far. Substorms often accompany intense space storms that can disrupt radio communications and global positioning system signals and cause power outages. Solving the mystery of where, when, and how substorms occur will allow scientists to construct more realistic substorm models and better predict a magnetic storm's intensity and effects.

The Ulysses mission has found that the current solar magnetic field strength in the heliosphere is about 40 percent lower than during any solar cycle since the space age began. At the same time, measurements by the SOHO spacecraft indicate that the Sun's polar fields are smaller by a factor of two. The change in strength suggests that the upcoming solar cycle may be significantly different than previously well-observed cycles. The heliosphere as a whole will temporarily shrink in size and, therefore, the intensity of the galactic cosmic rays at Earth may rise to record levels.

Noctilucent clouds that exist 50 miles above Earth's surface vary in ways that appear to be connected with global climate change and with solar variability. Noctilucent cloud structures observed for the first time by the AIM mission exhibit complex features surprisingly similar to those present in normal tropospheric clouds. These features may be caused by small-scale convective activity high in the mesosphere, which suggests that the mesosphere may share some of the same dynamical processes that are responsible for weather nearer to Earth's surface. Convection so high above the surface was unexpected because this region is the coldest part of the entire planet, so the presence of convective motion would indicate an entirely different understanding of how noctilucent clouds form and vary.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Demonstrate progress in understanding how human society, technological systems, and the habitability of planets are affected by solar variability and planetary magnetic fields. Progress will be evaluated by external expert review.	5SEC8 Green 5SEC11 Green	6ESS10 Green 6ESS13 Green	7ESS19 Green	**8HE03 Green**
Complete Phase A for the Geospace Radiation Belt Storm Probes mission	None	6ESS18 Green	7ESS16 Green	**8HE04 Green**

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.

FY05	FY06	FY07	FY 2008
15.1 Green	3B.3 Green	3B.3 Green	**Green**

The twin STEREO imagers have exceeded expectations with their ability to image the slow solar wind, co-rotating interaction regions, and coronal mass ejections. STEREO observed a series of solar wind wave fronts sweeping past Earth. As each of these wave fronts moved past Earth, the Wind spacecraft recorded a series of density compressions in front of recurrent solar wind high-speed streams that have been identified by scientists as the corresponding in-situ counterpart to the STEREO observations. This unexpected capability to follow recurrent solar wind structure will lead to advances in understanding of solar wind propagation and the formation of geoeffective compressions through the inner solar system during this unusual solar minimum period.

New Living with a Star tools provide commercial aviation groups with up-to-the-minute and 72-hour global forecasts of high frequency radio ranges along specific flight routes. The Communication Alert and Prediction System (CAPS) provides air carriers with information to minimize last-minute flight rerouting due to radio outages caused by space weather events. Earth-orbiting satellites provide up-to-the-minute information on space weather activity that researchers translate into four-dimensional models of the ionosphere. The CAPS system can be used with the new "4Dionosphere" model released through Google Earth. Refreshed every 10 minutes, a flight controller can examine the ionosphere from the flyer's point of view and use that information to anticipate problems that could cause a flight to be delayed or diverted.

A comparison of simulations with imaging and data from several NASA missions reveals that the solar corona is heated by mechanisms that are likely to be highly impulsive, concentrated close to the solar surface, or both. The X-ray and ultraviolet radiation from the Sun—the solar spectral irradiance—controls the dynamics, chemistry, and ionization state of Earth's upper atmosphere. Variations in the radiation affect radio signals and satellites and thereby impact communication, navigation, surveillance, and space debris collision avoidance. Having this capability requires an understanding of the mechanism that heats the outer part of the solar atmosphere, known as the corona, to multi-million degree temperatures. Researchers have shown that traditional models of the corona that assume steady and uniform heating are inconsistent with observations. Efforts are now underway to use this new result to build models of solar active regions, models that may one day be used for space weather forecasting of the spectral irradiance.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Demonstrate 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. Progress will be evaluated by external expert review.	5SEC6 Green 5SEC7 Green	6ESS8 Green 6ESS9 Green	7ESS20 Green	**8HE05 Green**
Complete Solar Dynamics Observatory (SDO) Integrated Observatory Performance Test.	5SEC2 Green	6ESS17 Green	7ESS14 Yellow	**8HE06 Green**

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

	Green	Yellow	Red	White
4 Outcomes	4	0	0	0
9 APGs	8	1	0	1

Expenditures (In Millions of Dollars)
$1,555

Responsible Mission Directorate

Science (SMD)

Exploration Systems (ESMD)

Contributing Theme

Planetary Science

Advanced Capabilities

Theme Description

The Planetary Science Theme seeks to understand how the solar system formed and evolved, and whether there might be life in the solar system beyond Earth.

The Advanced Capabilities Theme provides knowledge, technology, and innovation that will enable current and future exploration missions, as outlined in NASA's Strategic Plan. The Advanced Capabilities programs and their projects provide knowledge as a result of ground based research and technology development, research conducted in space, and observations from robotic flight missions. Advanced Capabilities also develops and matures advanced technology, integrates that technology into prototype systems, and transitions knowledge and technology to the Constellation Program.

PART Assessment Rating

Theme	Last Year Assessed	Overall Rating	Program Purpose and Design	Strategic Planning	Program Management	Program Results/ Accountability
Advanced Capabilities	2007	Adequate	100%	90%	75%	45%
Solar System Exploration	2006	Effective	100%	100%	91%	74%

To achieve Sub-goal 3C, the Planetary Science Theme 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 the origin, evolution, and habitability of terrestrial bodies. 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.

Benefits

NASA's robotic science missions are paving the way for understanding the origin and evolution of the solar system and to identify past and present habitable locations. With this knowledge, the Theme also is potentially enabling human space exploration by studying and characterizing alien environments and identifying possible resources that will enable safe and effective human missions to the Moon and beyond.

Robotic explorers gather data to help scientists understand how the planets formed, what triggered different evolutionary paths among planets, and how Earth formed, 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.

Through the Near Earth Object Observation Program, NASA identifies and categorizes asteroids and comets that come near Earth. Every day, a hundred tons of interplanetary particles drift down to Earth's surface, mostly in the form of dust particles. Approximately every 100 years, rocky or iron asteroids larger than 50 meters crash to Earth, causing damage like craters and tidal waves, and about every few hundred thousand years, an asteroid larger than a kilometer threatens Earth. In the extremely unlikely event that such a large object threatens to collide with Earth, NASA's goal is to provide an early identification of these hazardous objects as far in advance (perhaps years) as possible.

Risks to Achieving Sub-goal 3C

Of primary concern for Planetary Science is the reduction in Expendible Launch Vehicle (ELV) options. Over the course of the last decade, the Delta II has been the workhorse for SMD. Its loss leaves only larger and costlier evolved ELVs (e.g., the Delta IV and Atlas V) for many of the missions identified in the NASA Science Plan or much smaller launch vehicles with significantly reduced capabilities for missions such as those in the Discovery Program. NASA is aggressively exploring options to maintain a vital flight program, including the development of dual payload launch capability and alternate launch providers for mid-range planetary payloads.

MSL currently is scheduled for launch in September or October 2009. A launch slip would mean a significant increase in the lifecycle cost of the mission, which would impact resources available to conduct other projects supporting Sub-goal 3C.

FY 2009 Performance Forecast

- SMD will issue Research Opportunities in Space and Earth Science in 2009 (ROSES-09), a research announcement covering all of the planned research solicitations in Planetary Science Research for FY 2009.
- The MESSENGER spacecraft will complete second and third fly-bys of Mercury.
- NASA's M3 instrument, launched in October 2008 as a part of the Indian Space Research Organization's Chandrayaan-1 payload, will collect science measurements in 2009.
- GRAIL, the newly selected Discovery full-class mission, is expected to complete its Preliminary Design Review by the end of FY 2009.
- SMD will release an Announcement of Opportunity for the next New Frontiers mission.
- The Juno mission will start Critical Design Review by the end of FY 2009.
- The New Horizons spacecraft will have passed the orbit of Saturn on its cruise to Pluto. It is on track for a July 2015 arrival. The cruise period will include periodic spacecraft and instrument checkouts.
- MSL will be in the final stages of preparation for its launch readiness date in October 2009.
- Instrument developments for the European Space Agency's (ESA's) ExoMars mission, will complete technology development studies needed to qualify for possible later selection for flight, in support of a 2016 launch date.
- Planetary Sciences will begin detailed architectural studies of a Mars Sample Return mission to identify important tools, techniques, and technologies that must be developed to support the mission.
- The Cassini spacecraft's major targets include several close flybys of Saturn' moon, Enceladus, as well as over a dozen flybys of the moon Titan. Cassini also will continue studies of Saturn and its rings.
- Having selected the destination for the Outer Planets Flagship mission, NASA will begin a more intense pre-Phase A formulation in conjunction with ESA.
- The In-Space Propulsion project will continue electric propulsion life validation testing and analysis of NASA's Evolutionary Xenon Thruster; complete highpriority technology development activities for aerocapture; and continue electric propulsion Hall thruster development towards Technology Readiness Level 6.
- The Radioisotope Power Systems project will integrate the first-generation Stirling converters into an engineering model generator assembly, which will then undergo life-testing to provide reliability data. The project will begin development of one Advanced Stirling Radioisotope Generator proto-flight unit for delivery in 2013.

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

FY05	FY06	FY07	FY 2008
3.2 Green	3C.1 Green	3C.1 Green	**Green**
3.3 Green			

On the first of its passes by Mercury, the MESSENGER spacecraft provided new insights into the origin and evolution of the solar system's smallest planet. MESSENGER confirmed that Mercury has a dipolar internal magnetic field, created an inventory of the heavy ions in the planet's magnetosphere, and detected two current sheet boundaries that may indicate a planetary ion boundary layer. In addition, MESSENGER instruments revealed landforms supporting the hypothesis that Mercury contracted globally in response to interior cooling and growth of a solid core. The planet's solid core, consisting largely of iron, generates the magnetic field, which is only about one percent as strong as Earth's but is dipolar like Earth's.

The Gamma Ray Spectrometer on the Mars 2001 Odyssey spacecraft has mapped concentrations of several different atoms, including hydrogen, silicon, chlorine, potassium, iron, and thorium. These data provide an important foundation for understanding the composition and evolution of the Martian surface. The water-equivalent concentration of hydrogen, which is how much water would be present if the hydrogen were bound in water, is about 1.5 to 7.5 percent (by mass), with the most enriched areas being near Apollinaris Patera and Arabia Terra. The distribution of the other important elements show regional variations across the surface, with silicon showing the least variation, varying only 18 to 22 percent over most of the planet. There appears to be no evidence of significant globally distributed thick dust deposits of uniform composition.

In the ongoing quest to understand the origins of life on Earth, researchers from NASA's Astrobiology Program reported that concentrations of amino acids 10 times higher than levels previously discovered were found in two meteorites. These results suggest that the early solar system was far richer in the organic building blocks of life than was previously thought. This may indicate that organic fallout from space may have spiked Earth's primordial broth.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Demonstrate progress in learning how the Sun's family of planets and minor bodies originated and evolved. Progress will be evaluated by external expert review.	5SSE7 Green	6SSE7 Green	7SSE1 Green	**8PS01 Green**
Complete Mercury Surface, Space Environment, Geochemistry, and Ranging (MESSENGER) Mercury Flyby 1.	None	6SSE28 White	7SSE2 Green	**8PS02 Green**
Begin Juno instruments detailed design.	None	None	7SSE3 White	**8PS03 Green**

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.

FY05	FY06	FY07	FY 2008
3.7 Green	3C.2 Green	3C.2 Green	**Green**
3.8 Green			

NASA made progress toward a theory of how sulfates formed on Mars due to atmospheric processes influenced by early volcanism. High levels of sulfur expelled by volcanoes would be in the forms of sulfur dioxide and hydrogen sulfide, both powerful greenhouse gases. On Earth, sulfur dioxide is rapidly oxidized to sulfate and then removed from the atmosphere. It is likely that early Mars lacked oxygen, so the sulfur dioxide remained much longer in the atmosphere. Water and sulfur dioxide in the early upper Martian atmosphere would produce numerous sulfate aerosols, creating a cloud system similar to what is seen on Venus today. The rain out of sulfuric acid into standing bodies of water explains the isochemical nature of the alteration discovered in the Meridiani outcrops. It also helps explain how the pH of surface waters was low enough to prevent the precipitation of massive layers of carbonate. This helped sustain a thick, wet carbon dioxide atmosphere and its resulting greenhouse effect during the Noachian epoch, about 4.6 to 3.5 billion years ago. As volcanism on Mars waned, waters became less sulfate rich and carbon dioxide could have fallen in cracks and formed patinas on rocks. This layer of ancient atmosphere is probably a component of Mars' dust today, as it has eroded from surface exposures for over three billion years.

The Cassini spacecraft performed a flyby of Saturn's moon Enceladus, coming within 50 kilometers of the moon's surface. During the flyby, the spacecraft collected samples that may provide evidence of a water ocean and organics. The flyby also provided images of the surface that are providing data on the difference between the north and south poles, which is critical to understanding the moon's geological evolution. Furthermore, there is evidence of some complex organic chemicals and several other conditions that scientists believe to be the pre-conditions for life. Future flybys and possibly future missions will provide more pieces in this intriguing puzzle.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Demonstrate 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. Progress will be evaluated by external expert review.	5SSE12 Green	6SSE12 Green	7SSE4 Green	**8PS04 Green**
	5SSE13 Green	6SSE13 Green		
	5SSE14 Green	6SSE14 Green		
	5MEP7 Green	6SSE15 Green		
	5MEP8 Blue	6SSE16 Green		
	5MEP9 Green	6SSE17 Green		
	5MEP10 Green	6SSE18 Green		
	5MEP11 Yellow	6SSE19 Yellow		
Begin 2009 Mars Science Laboratory (MSL) Assembly, Test, Launch Operations (ATLO).	5MEP4 Yellow	6SSE25 Green	7SSE5 Green	**8PS05 Green**

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.

FY05	FY06	FY07	FY 2008
2.1 Green	3C.3 Green	3C.3 Green	**Green**
2.2 Green			
2.3 Green			
2.5 Green			
2.6 Green			
3.6 Green			

Laboratory tests conducted aboard NASA's Phoenix Mars Lander have identified water in a soil sample. The lander's robotic arm delivered the sample to an instrument that identifies vapors produced by the heating of samples. Since landing in May 2008, Phoenix has been studying the Martian soil with a chemistry lab, a microscope, a conductivity probe, and cameras. Besides confirming the 2002 Mars Odyssey finding of water ice near the surface, the science team has tried to determine whether the water ice ever thaws enough to allow biological process and if carbon-containing chemicals and other raw materials necessary for life are present. Phoenix completed its primary mission in August and has begun a 90-day extended mission to study the geologic history and biological potential of the Martian arctic.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Demonstrate 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. Progress will be evaluated by external expert review.	5MEP12 Green	6SSE20 Yellow	7SSE6 Green	**8PS06 Green**
Land the Phoenix spacecraft on the Martian surface and begin science operations.	None	None	7SSE7 Green	**8PS07 Green**

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.

FY05	FY06	FY07	FY 2008
2.7 Green	3C.4 Green	3C.4 Green	**Green**
3.9 Green			
3.10 Green			

Phoenix confirmed that a significant amount of water exists on the surface of arctic Mars, a potential resource for future human exploration. Phoenix also discovered a class of compounds called perchlorates in the soil. Although a few biological forms on Earth use perchlorates as an energy source, they are generally toxic to most life forms if consumed. Alternatively, perchlorates are routinely used as the oxidizer in rocket fuel, also a potential resource. The lander's meteorological station documented the weather in the Martian polar north as having a temperature range from approximately -20 to -115 degrees Fahrenheit during the summer. As the Martian fall approaches, temperatures have been falling sharply. These temperatures pose challenges to human exploration of the Martian polar regions.

Asteroid search teams funded by NASA's Near Earth Object Observation Program found 25 asteroids larger than one kilometer in size with orbits coming within Earth's vicinity. In addition, the teams also found 770 smaller asteroids of less than one kilometer in diameter, bringing the total number known of all sizes to 5,585. Only one more Earth approaching comet was found this year. The high-precision orbit predictions computed by NASA's Jet Propulsion Laboratory show that none of the objects is likely to hit Earth in the next century. However, 979 are in orbits that could become a hazard in the more distant future and warrant monitoring, of which 140 are larger than one kilometer in diameter. Of all these potential hazards, 100 were found this year alone, three larger than one kilometer in diameter.

The results of a population study conducted two years ago indicated that the total population of near-Earth asteroids larger than one kilometer in size is somewhere between 910 to 980. Taking this into account, scientists have found 755 to date, placing the program at 80 percent through the task of finding 90 percent of the population by December 2008. As is common in search efforts of this kind, it becomes much harder to find the remaining objects as one gets closer to the total population. Scientists have found the easy-to-detect objects, and NASA is approaching the detection limits of its current search capabilities. NASA has stopped some of the program's less-capable search projects in order to apply funding to upgrades of the more-capable projects and acquire better search assets. One such asset is the U.S. Air Force Panoramic Survey Telescope and Rapid Response System (Pan-STARRS), which NASA started to fund in FY 2008 to conduct near-Earth object search activities. As Pan-STARRS becomes operational in FY 2009, it will boost NASA's search capability.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Develop and deliver the Radiation Assessment Detector (RAD) for the Mars Science Laboratory, scheduled to fly in 2009.	None	None	None	**8AC04 Yellow**
Demonstrate progress in exploring the space environment to discover potential hazards to humans and to search for resources that would enable human presence. Progress will be evaluated by external expert review.	5SSE5 Green	6SSE5 Green	7SSE8 Green	**8PS08 Green**
	5MEP13 Green	6SSE21 Green		
	5MEP14 Yellow	6SSE22 Green		

Why NASA did not achieve APG 8AC04: The slight slip in schedule was due to the need to address technical issues with the power systems and some failing parts at a vendor. Both these issues have been addressed to NASA's satisfaction.

Plans to achieve 8AC04: The RAD instrument is scheduled for delivery to NASA's Jet Propulsion Laboratory for final integration with the MSL rover on November 10, 2008. RAD will be temporarily integrated with MSL the week of September 2, 2008, to verify electrical interfaces, and then returned to Southwest Research Institute for environmental testing. NASA does not anticipate any impacts to the MSL schedule.

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

	Green	Yellow	Red	White
4 Outcomes	4	0	0	0
10 APGs	10	0	0	0

Expenditures (In Millions of Dollars)
$1,749

Responsible Mission Directorate

Science (SMD)

Contributing Theme

Astrophysics

Theme Description

The Astrophysics Theme seeks to understand the origin, evolution, and destiny of the universe, galaxies, stars, and planets, determine the physical and chemical processes that govern the universe.

PART Assessment Rating						
Theme	**Last Year Assessed**	**Overall Rating**	**Program Purpose and Design**	**Strategic Planning**	**Program Management**	**Program Results/ Accountability**
Astrophysics	2007	Adequate	100%	100%	75%	47%

Through Sub-goal 3D, the Astrophysics Theme seeks to answer some of humankind's enduring questions: How did the universe begin? Will the universe have an end? 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.

Benefits

The study of the universe benefits the Nation's scientific research community by focusing research and advanced technology development on optics, sensors, guidance systems, and propulsion systems. Some of these new and improved technologies enable ground-breaking capabilities, which are then available to both 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 and serve to prominently illustrate the role of the United States in scientific exploration.

Risks to Achieving Sub-goal 3D

For FY 2009, successful completion of Hubble Servicing Mission #4 (SM4) and the Integrated Science Instrument Module Critical Design Review for the James Webb Space Telescope are critical milestones for a successful year. Final determination of the SM4 launch date rests largely with the Missions Operations Directorate, but delays could result in cost impacts to the Astrophysics budget.

Maintaining cost and schedule on the Kepler and WISE missions, each scheduled for a 2009 launch, also is critical. SMD continues to monitor the projects' performance to ensure adherence to plans. NASA is addressings risk to launch dates caused by unavailability of launch vehicles.

FY 2009 Performance Forecast

- SMD will issue Research Opportunities in Space and Earth Science in 2009 (ROSES-09), a research announcement covering all of the planned research solicitations in Astrophysics Research for FY 2009.
- The missions managed by the Astrophysics Research Program—including Fermi Gamma-ray Space Telescope (formerly called GLAST), Chandra X-ray Observatory, Spitzer Space Telescope, Swift, and WMAP—will continue high-quality astrophysics research consistent with NASA's goals.
- NASA will complete Hubble SM4 and the on-orbit checkout of instruments. The recent on-orbit failure of the data-formatting computer, after eighteen years of operation, prompted a delay in the servicing mission so that the existing flight spare could be prepared for installation in spring 2009.
- Astrophysics will complete the Integrated Science Instrument Module Critical Design Review for the JWST mission.
- The Spitzer Space Telescope will exhaust its supply of on-board cryogens and transition to a scaled-down post-cryogen ("warm") mission operations phase involving observations with the two remaining functional channels of the Infrared Array Camera.
- The Beyond Einstein Program will release an Announcement of Opportunity for JDEM science investigations.
- Kepler, WISE, Herschel, and Planck are scheduled to launch and begin operations.
- Astrophysics will begin open door testing for SOFIA.

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

FY05	FY06	FY07	FY 2008
5.1 Green	3D.1 Green	3D.1 Green	**Green**
5.4 Green			
5.5 Green			
5.6 Green			

Observations from NASA's space astronomy observatories and modeling and analysis of archival data have advanced understanding of black holes, the nature of the environment in their vicinity, the warping of space-time, and the role black holes play in galaxy evolution.

A new study using results from NASA's Chandra X-ray Observatory provides one of the best pieces of evidence yet that many supermassive black holes are spinning extremely rapidly. The whirling of these giant black holes drives powerful jets that pump huge amounts of energy into their environment and affect galaxy growth. Astronomers think these monster black holes are spinning close to the limit set by Einstein's theory of relativity, which means that they can drag material around them at close to the speed of light. One significant consequence of powerful, black-hole jets in galaxies in the centers of galaxy clusters is that they can pump enormous amounts of energy into their environments, and heat the gas around them. This heating prevents the gas from cooling, and affects the rate at which new stars form, thereby limiting the size of the central galaxy. Understanding the details of this fundamental feedback loop between supermassive black holes and the formation of the most massive galaxies remains an important goal in astrophysics.

Using the European Space Agency's XMM-Newton X-ray Observatory and the Japanese-NASA Suzaku X-ray observatory, astronomers have seen Einstein's predicted distortion of space-time around three neutron stars. In doing so, the observatories have pioneered a groundbreaking technique for determining the properties of these ultradense objects. Using XMM-Newton, astronomers observed a binary system known as Serpens X-1, which contains a neutron star and a stellar companion. They studied a spectral line from hot iron atoms that are whirling around in a disk just beyond the neutron star's surface at 40 percent of the speed of light. The warping of space-time by the neutron star's powerful gravity, an effect explained by Einstein's general theory of relativity, shifts the neutron star's iron line to longer wavelengths. Astronomers used Suzaku's superb spectral capabilities to survey three neutron-star binaries: Serpens X-1, GX 349+2, and 4U 1820-30. They observed a nearly identical iron line as in Serpens X-1, confirming the XMM-Newton result. Knowing a neutron star's size and mass allows scientists to describe the "stiffness," or "equation of state," of matter packed inside these incredibly dense objects. Besides using these iron lines to test Einstein's general theory of relativity, astronomers can probe conditions in the inner part of a neutron star's accretion disk.

Using a new technique, two NASA scientists have identified the lightest known black hole. With a mass only about 3.8 times greater than the Sun and a diameter of only 15 miles, the black hole lies very close to the minimum size predicted for black holes that originate from dying stars. To measure the black hole masses, scientists used archival data from NASA's RXTE satellite, applying a method that uses a relationship between black holes and the inner part of their surrounding disks, where gas spirals inward before making the fatal plunge. Below some unknown critical threshold, a dying star should produce a neutron star instead of a black hole. Scientists think the boundary between black holes and neutron stars lies somewhere between 1.7 and 2.7 solar masses. Knowing this dividing line is important for fundamental physics, because it will tell scientists about the behavior of matter when it is scrunched into conditions of extraordinarily high density.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Demonstrate progress in understanding the origin and destiny of the universe, phenomena near black holes, and the nature of gravity. Progress will be evaluated by external expert review.	5SEU4 Green	6UNIV8 Green	7UNIV1 Green	**8AS01 Green**
	5SEU5 Blue	6UNIV9 Green		
	5SEU6 Green	6UNIV10 Green		
	5SEU7 Green	6UNIV11 Green		
	5SEU8 Yellow	6UNIV12 Green		
	5SEU9 Blue	6UNIV13 Green		
	5SEU11 Blue	6NIV15 Green		
Launch the Gamma-ray Large Area Space Telescope (GLAST).	5SEU1 Yellow	6UNIV19 Yellow	7UNIV2 Yellow	**8AS02 Green**

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.

FY05	FY06	FY07	FY 2008
4.1 Green	3D.2 Yellow	3D.2 Green	**Green**

New observations from the Hubble Space Telescope, the Spitzer Space Telescope, and the GALEX spacecraft led to advances in the understanding of the birth and evolution of galaxies.

Using data from the NASA-funded Sloan Digital Sky Survey and the NASA 2 Micron All-Sky Survey archive, an international team of scientists unveiled the most complete and detailed map yet of the chemical composition of the Milky Way galaxy. By mapping how the metal content of stars varies throughout the Milky Way, astronomers can decipher star formation and evolution. Known star streams that appear to be the remnants of galaxies taken over by the Milky Way are found to be composed of stars with chemical contents that are different from that expected for the Milky Way. Many features of the map confirm standard views of the structure of the Milky Way. However, the projected motions measured for metal-poor stars appear to contradict a long-standing hypothesis of galaxy construction: that an ancient act of galactic cannibalism gave rise to the "thick disk" of stars enveloping the thin disk in which the Sun resides.

Scientists stitched together more than 800,000 snapshots from Spitzer to create a new "coming of age" portrait of stars in the inner Milky Way galaxy. The image is the highest-resolution, largest, most sensitive infrared picture ever taken of the Milky Way. With this data, scientists can learn how massive stars form, map galactic spiral arms, and make a better estimate of the galaxy's star-formation rate.

A new image from GALEX shows baby stars sprouting in the backwoods of a galaxy, a relatively desolate region of space more than 100,000 light-years from the galaxy's bustling center. The striking image, a composite of ultraviolet data from GALEX and radio data from the National Science Foundation's Very Large Array in New Mexico, shows the Southern Pinwheel galaxy, also known as M83. In the new view, the main spiral, or stellar disk, of M83 looks like a pink and blue pinwheel, while its outer arms appear to flap away from the galaxy like giant red streamers. It is within these so-called extended galaxy arms that, to the surprise of astronomers, new stars are forming.

Spitzer spotted four galaxies slamming into each other, and kicking up billions of stars in one of the largest cosmic smash-ups ever observed. The four galaxies will eventually merge into a single galaxy up to 10 times as massive as the Milky Way. This rare sighting provides an unprecedented look at how the most massive galaxies in the universe form. The Spitzer observations also show that the new merger lacks gas. Theorists predict that massive galaxies grow in a variety of ways, including gas-rich and gas-poor mergers. In gas-rich mergers, the galaxies are soaked with gas that ignites to form new stars. Gas-poor mergers lack gas, so few new stars are formed. Spitzer found only old stars in the quadruple encounter. The Spitzer data represents the best evidence that the biggest galaxies in the universe formed fairly recently through major mergers.

NASA's Hubble and Spitzer space telescopes uncovered what may be one of the youngest and brightest galaxies ever seen in the middle of the cosmic "dark ages," just 700 million years after the Big Bang but before the first stars reheated the cold, dark universe. The detailed images reveal an infant galaxy undergoing a firestorm of star birth. This finding should offer insights into the formative years of galaxy birth and evolution and yield information on the types of objects that may have contributed to ending the dark ages.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Demonstrate progress in understanding how the first stars and galaxies formed, and how they changed over time into the objects we recognize in the present universe. Progress will be evaluated by external expert review.	5SEU10 Green 5SEU12 Green 5ASO5 Green	6UNIV14 Green 6UNIV16 Yellow 6UNIV17 Green	7UNIV5 Green	**8AS03 Green**
Complete James Webb Space Telescope (JWST) Preliminary Design Review (PDR).	None	6UNIV20 Red	7UNIV4 Green	**8AS04 Green**
Complete Hubble Space Telescope Servicing Mission 4 (HST SM4) Pre-ship Review.	None	None	7UNIV3 Green	**8AS05 Green**

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

FY05	FY06	FY07	FY 2008
4.3 Green	3D.3 Yellow	3D.3 Green	**Green**

GALEX has spotted a long comet-like tail behind a star streaking through space at supersonic speeds. The star, named Mira, is located 350 light-years from Earth in the constellation Cetus. It is a fast-moving, older star called a red giant that is losing large amounts of surface material. Material coming off Mira is forming a path 13 light-years long, or about 20,000 times the average distance of Pluto from the Sun. Astronomers say Mira's tail offers a unique opportunity to study how stars like the Sun die and ultimately give birth to new solar systems. As Mira hurtles along, its tail sheds carbon, oxygen, and other important elements needed for new stars, planets, and even life to form. Over the past 30,000 years, this tail has released enough material to form at least 3,000 Earth-sized planets or nine Jupiter-sized ones.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Complete James Webb Space Telescope (JWST) Preliminary Design Review (PDR).	None	6UNIV20 Red	7UNIV4 Green	**8AS04 Green**
Complete Hubble Space Telescope Servicing Mission 4 (HST SM4) Pre-ship Review.	None	None	7UNIV3 Green	**8AS05 Green**
Demonstrate progress in understanding how individual stars form and how those processes ultimately affect the formation of planetary systems. Progress will be evaluated by external expert review.	5ASO6 Green 5ASO7 Green	6UNIV1 Green 6UNIV2 Green	7UNIV6 Green	**8AS06 Green**

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

FY05	FY06	FY07	FY 2008
3.4 Green	3D.4 Yellow	3D.4 Yellow	**Green**

NASA issued an open competition for large and medium class mission concept studies. Seven exoplanet mission concept studies were selected and funded. The selected mission concept studies will be part of the missions reviewed by the upcoming National Research Council's Astrophysics and Astronomy Decadal review that will start in 2009. The recommendations and rankings of the decadal report will then help form the focus of Astrophysics's budget strategies in the coming decade, including the priority of exoplanet space missions.

Observations from Hubble have provided new knowledge on the atmospheres of extrasolar planets. Hubble has made the first detection ever of an organic molecule in the atmosphere of a Jupiter-sized planet orbiting another star. This breakthrough is an important step in eventually identifying signs of life on a planet outside our solar system. The molecule found by Hubble is methane, which under the right circumstances can play a key role in prebiotic chemistry, the chemical reactions considered necessary to form life as we know it. This discovery proves that Hubble and upcoming space missions, such as JWST, can detect organic molecules on planets around other stars by using spectroscopy, which splits light into its components to reveal the "fingerprints" of various chemicals. The planet now known to have methane and water is located 63 light-years away in the constellation Vulpecula. Called HD 189733b, the planet is so massive and so hot it is considered an unlikely host for life.

Using Spitzer, astronomers have discovered that terrestrial planets might form around many of the nearby sun-like stars in our galaxy. These new results suggest that worlds with potential for life might be more common than we thought. The astronomers used Spitzer to survey six sets of stars, grouped depending on their age, with masses comparable to our sun. The Spitzer telescope does not detect planets directly. Instead it detects dust—the rubble left over from collisions as planets form—at a range of infrared wavelengths. Because dust closer to the star is hotter than dust farther from the star, the "warm" dust likely traces material orbiting the star at distances comparable to the distance between Earth and Jupiter.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Demonstrate progress in creating a census of extra-solar planets and measuring their properties. Progress will be evaluated by external expert review.	5ASO8 Green	6UNIV3 Green	7UNIV7 Green	**8AS07 Green**
	5ASO9 Blue	6UNIV4 Green		
	5ASO10 Blue	6UNIV5 Yellow		
Complete the Kepler spacecraft Integration and Test (I&T)	5ASO2 Green	6UNIV21 Yellow	7UNIV8 Green	**8AS08 Green**

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

	Green	Yellow	Red	White
4 Outcomes	4	0	0	0
16 APGs	12	2	2	0

Expenditures (In Millions of Dollars)
$695

Responsible Mission Directorate

Aeronautics Research (ARMD)

Contributing Theme

Aeronautics Technology

Theme Description

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. At the same time, Aeronautics Technology ensures that its research continues to play a vital role in support of the Agency's space exploration missions.

PART Assessment Rating						
Theme	**Last Year Assessed**	**Overall Rating**	**Program Purpose and Design**	**Strategic Planning**	**Program Management**	**Program Results/ Accountability**
Aeronautics Technology	2007	Effective	100%	100%	91%	78%

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. ARMD is comprised of four programs:

- The Fundamental Aeronautics Program has the principal objective of overcoming today's national challenges in air transportation such as public concern over noise and emissions; increasing costs associated with high fuel consumption; and progress towards faster means of transportation. The program develops focused technological capabilities and conducts research to enable the design of vehicles that fly through any atmosphere at any speed. Future aircraft must address multiple design challenges, and therefore a key focus will be the development of physics-based, multidisciplinary design, analysis, and optimization (MDAO) tools.
- The Aviation Safety Program develops innovative tools, concepts, methods, and technologies that will improve the intrinsic safety attributes of current and future aircraft, and that will help overcome aviation safety challenges that would otherwise constrain the full realization of the Next Generation Air Transportation System (NextGen).
- The Airspace Systems Program conducts research to enable NextGen capabilities such as foundational research in multi-aircraft flow and airspace optimization, trajectory design and conformance, separation methods, and adaptive systems. The Airspace Systems Program research for the airspace and airportal domains is integrated into gate-to-gate solutions.
- The Aeronautics Test Program (ATP) ensures the strategic availability and accessibility of a critical suite of major wind tunnels at Ames, Glenn, and Langley Research Centers, and flight operations assets at the Western Aeronautical Test Range, support/testbed aircraft, and simulation and loads labs at Dryden Flight Research Center.

Benefits

NASA's aeronautics program ensures long-term focus in fundamental research in both traditional aeronautical disciplines and relevant emerging fields for integration into multidisciplinary system-level capabilities for broad application. This approach will enable revolutionary change to both the airspace system and the aircraft that fly within it, leading to a safer, more environmentally friendly, and more efficient national air transportation system. Furthermore, ARMD will disseminate all of its research results to the widest practical and appropriate extent (consistent with foreign policy and national security).

ARMD uses the NASA Research Announcement (NRA) process to foster collaborative research partnerships with the academic and private sector communities. The NRA process encourages awardees to spend time at NASA centers in order to enhance the exchange of ideas and expand the learning experience for everyone involved. Furthermore, ARMD has

focused its educational activities to better attract the Nation's best and brightest students to aeronautics. These activities include design competitions and the establishment of graduate and undergraduate scholarships and internships.

Risks to Achieving Sub-goal 3E

NASA identifies highly challenging, cutting-edge aeronautics research goals that, by their nature, are inherently high risk. Even if each milestone is not met, the lessons that NASA learns advance the state of knowledge for 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, Airspace Systems, and Aeronautics Test 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.

FY 2009 Performance Forecast

Fundamental Aeronautics Program

- The Subsonic Fixed Wing (SFW) project will complete and validate the first generation of a multidisciplinary analysis and design toolset to evaluate the trades between noise, emissions, and performance of future aircraft entering service in the 2012-2015 timeframe. The project will also develop a database of alternative fuels to enable assessments of their utility leading to benefits of reduced emissions.
- The Subsonic Rotary Wing (SRW) project will advance variable/multi-speed drive system modeling tools and concepts to enable a critical capability in propulsion.
- The Supersonics project will enable a robust computational fluid dynamics-based rapid design and analysis capability via the development of adjoint-based grid adaptation methods.
- The Hypersonics project will advance propulsion cycle technology and increase the fidelity of the analysis capability. The project will validate the computational fluid dynamics prediction and quantification of a high-Mach number turbine fan aerodynamic performance. The project will also test a Mach 4+ turbine fan stage to evaluate the impact of tip clearance and simulated distorted inlet flow on performance operability.

Aviation Safety Program

- All four projects have developed 10-year project plans with milestones and metrics.
- Researchers in the Integrated Vehicle Health Management (IVHM) project will develop advanced propulsion health monitoring sensors to detect gradual and abrupt changes within the gas path of an aircraft engine. In 2009, this technology will demonstrate a 10 percent improvement in estimation accuracy.
- Researchers in the Aircraft Aging and Durability (AAD) project will develop technologies to reduce the risk of aircraft engine disk failure in advanced propulsion systems with higher operating temperatures. In 2009, the project will conduct a spin test of a third-generation superalloy engine disk to verify enhanced disk rim attachment strength at the component level.
- Researchers in the Integrated Intelligent Flight Deck (IIFD) project will deliver findings on technologies that have the potential to mitigate crew-vehicle interface safety concerns that could constrain implementation of NextGen key capabilities.
- Researchers in the Integrated Resilient Aircraft Control (IRAC) project will be developing the capability to perform in-flight integrity monitoring of adaptive flight control systems. In 2009 the project will design and evaluate through simulation on-line integrity monitoring for adaptive control systems.

Airspace Systems Program

- The Airspace project will complete analysis and laboratory validation of trajectory analysis methods for the simultaneous solution of separation and time-based metering with user-preferred trajectories for multi-aircraft converging flows. Analysis will be conducted for large increases in capacity without reduction of baseline metering accuracy or separation violations under varying traffic complexities. The project will also develop traffic flow management concepts for increased efficiencies at the regional and national levels for different planning intervals.
- The Airportal project will develop algorithms to generate robust, optimized solutions for surface traffic planning and control, and initial algorithms for airportal arrival and departure balancing. The project will also determine research issues that are on a critical path to airportal metroplex capabilities and develop human/automation information requirements and decision-making guidelines.

Aeronautics Test Program

- As part of ATP's continuous efforts to improve facility operational efficiencies, the ATP-sponsored National Strain Gage Balance Team completed its technical review and concluded that NASA's capability to utilize strain gage balances in wind tunnel testing has severely eroded. Final study recommendations are currently under review, and implementation that began in FY 2008, will continue into FY 2009.
- A series of tests in the ATP transonic wind tunnels that began in FY 2008 will be completed in FY 2009.
- A comprehensive assessment of the wind tunnel systems maintenance requirements and the facility staff capabilities will be carried out in FY 2008 will be used in the development of a long term investment and staffing strategy starting in FY 2009.

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).

FY05	FY06	FY07	FY 2008
None	3E.1 Green	3E.1 Green	**Green**

AAD developed a framework to guide ongoing research to maximize aircraft aging and durability performance. The new framework integrates detection, prediction, and mitigation technologies using a goal-oriented systems structure. This new tool allows NASA to couple end-user requirements for aircraft design, operations, and sustainment with specific issues related to the diverse applications in airframes, propulsion, and wiring systems.

IRAC used simulation and flight testing to define control architectures capable of adapting to degradations in aircraft dynamics. NASA researchers developed three direct adaptive neutral-network-based flight control systems and subjected them to an in-flight simulation of a destabilizing failure on the NASA NF-15B Intelligent Flight Control System airplane. Results of the simulation and flight tests with the adaptation engaged indicated improvement in the vehicle stability margins. Adaptive flight control systems have the potential to be more resilient to extreme changes in airplane behavior.

IIFD conducted an experiment in a high-fidelity flight simulator to evaluate multiple display concepts during approach, landing, surface operations, and take-off operations. Twenty-four airline transport-rated pilots participated to assess the feasibility of the concepts for active operator assistance. A pilot's awareness and reactions to failure scenarios and other non-normal events are critical determinants in the underlying safety of all-weather terminal area operations.

IVHM developed and validated fault detection and isolation methods on a current generation aircraft electro-mechanical actuator test stand with realistic nominal and fault scenarios. A feed-forward neural network was used as a fault detector and classifier. Sensor information from the temperature and accelerometer sensors was fused to provide input to the neural network for classification. Results showed false positive rates less than one percent and false negative rates less than 10 percent. Improved robustness of the diagnostic systems in distinguishing and classifying faults, as in these simulations, is critical to enabling future integrated vehicle health management systems.

FY 2008 Annual Performance Goal	FY05	FY06	FY07	FY 2008
Provide definition of an Integrated Resilient Aircraft Control (IRAC) architecture and capabilities, and identify technology implementation barriers for full IRAC capability.	None	6AT14 Yellow 6AT15 Yellow	7AT1 Green	**8AT01 Green**
Complete a feasibility study for assessment of active operator assistance in approach and landing task, including active attention management.	None	6AT14 Yellow 6AT15 Yellow	7AT1 Green	**8AT02 Green**
Develop a framework that integrates Aging Aircraft and Durability technologies to detect, predict, and mitigate aging/durability related hazards and insert current state-of-the -art methods in framework to establish a baseline.	None	6AT14 Yellow 6AT15 Yellow	7AT1 Green	**8AT03 Green**
Using aircraft landing gear system as a testbed, develop and validate Integrated Vehicle Health Management sensor fusion, fault detection, and isolation methods.	None	6AT14 Yellow 6AT15 Yellow	7AT1 Green	**8AT04 Green**

FY 2008 Annual Performance Goal	FY05	FY06	FY07	FY 2008
		6AT4 Green		

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.

FY05	FY06	FY07	FY 2008
None	3E.2 Green	3E.2 Green	**Green**

NASA researchers, in collaboration with academia, industry, and the Federal Aviation Administration (FAA), completed a series of experiments that explored advanced concepts and technologies for separation assurance which ensures that aircraft maintain a safe distance from other aircraft, terrain, obstacles, and certain airspace not designated for routine air travel. Such technology is critical to relieving air traffic controller workload, a key constraint on airspace capacity.

The experiments examined the performance of six professional controllers and 20 professional pilots as they used separation-assurance automation in the face of nominal and dramatically increased (two-times and three-times) traffic demand through the FAA's Indianapolis Air Route Traffic Control Center. Varying levels of automation support were provided to the controller and pilot subjects, including automated conflict detection, automated strategic conflict resolution, and automated tactical conflict resolution. The test scenarios included routine operations and off-nominal situations such as data communication failures and aircraft blunders toward proximate traffic.

NASA's research into separation assurance automation addresses a key research need for the Next Generation Air Transportation System. By automating fundamental air traffic control functions such as conflict detection and resolution, some air traffic controller workload could be alleviated. While further investigation is required to validate the underlying technology and procedures, these concepts hold the promise of increasing the capacity of the U.S. air transportation system, allowing the economic growth that comes with improved mobility of people and goods about the country.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Conduct service-provider-based automated separation assurance simulation.	None	None	None	**8AT05 Green**
Demonstrate trajectory analysis technology for automated separation assurance.	None	None	None	**8AT06 Green**

Outcome 3E.3: By 2016, develop multidisciplinary analysis and design tools and new technologies, enabling better vehicle performance (e.g., efficiency, environmental, civil competitiveness, productivity, and reliability) in multiple flight regimes and within a variety of transportation system architectures.

FY05	FY06	FY07	FY 2008
None	3E.2 Green	3E.2 Green	**Green**

SFW completed wind-tunnel testing of several promising powered lift concepts. Powered lift concepts increase lifting force on an aircraft at slow speeds (e.g., at take-off and landing) without increasing drag under cruise conditions. Successful use of the concepts will enable short take-off and landings on runways less than 3000 feet, which will increase next generation air transportation system capacity through the use of shorter fields and improved low-speed maneuverability in airport terminal areas.

SFW continued to work toward reducing noise from conventional tube-and-wing type aircraft. The project completed wind tunnel testing for an ultra high bypass ratio engine (which reduces noise through an advanced, high-efficiency fan) to

identify airframe-propulsion integration challenges associated with such engines. Researchers also developed a "soft" vane concept that reduces the fan wake/stator interaction noise, and completed an engine test to demonstrate fan noise reduction capability for the Over-the-Rotor Foam Metal Liner concept.

SRW completed testing of a Smart Material Actuated Rotor Technology (SMART) helicopter rotor. The SMART rotor offers the potential for significant noise and vibration reduction in rotorcraft. SMART rotor wind tunnel tests demonstrated the effectiveness of the SMART rotor for noise and vibration control. This will enable reduction of interior cabin noise for passenger comfort and quiet operation of rotorcraft over populated areas.

The Supersonics project completed Nozzle Change Effects on Tail Shocks (LaNCETS) flight experiments to validate high-fidelity computational tools to predict the effect of jet plumes on shock waves that cause sonic booms in supersonic aircraft. The flight experiment involved two F-15s flying in close formation at supersonic speeds. The trailing F-15 had pressure sensors in its nose boom that measured the strength of the leading F-15's shock waves. Researchers compared the flight data with computed data, and found that the average computed shock wave position and strength compared within five percent of the flight data. This study is the first ever detailed assessment and comparison of nozzle plume shocks measured in flight, and represents a new state-of-the-art. The high fidelity computational tools will enable future designs of supersonic aircraft with reduced sonic boom signatures.

The Hypersonics project completed flight clearance testing of the X-51 X 2 hydrocarbon-fueled flight-weight scramjet engines in the NASA Langley's 8-Foot High Temperature Tunnel. The propulsion systems in scramjet engines use oxygen taken from the atmosphere for combustion rather than an onboard tank. The flight clearance test simulated Mach 5 flight conditions, as part of a collaborative effort between Pratt & Whitney Rocketdyne, the Air Force Research Laboratory, the Defense Advanced Research Projects Agency (DARPA), and the Boeing Company. The engine performance has met or exceeded the predictions throughout the test series. The successful ground test of the engine has qualified the engine for X-51 flight testing in 2009. The X-51 flight tests will demonstrate the operation of a scramjet-powered hypersonic system and lay the foundation for future hypersonic applications, including access to space.

SFW and the Supersonics project developed the next generation, called Gen 1, of an integrated multi-disciplinary toolset to enable design and analysis of advanced aircraft configurations with a higher degree of fidelity. NASA demonstrated the improved design and analysis capability was demonstrated on several test cases, which included aircraft with ultra high bypass engines, supersonic business jets, and short take-off and landing aircraft. The future version of the MDAO toolset, Gen 2, will incorporate models with significantly higher degree of fidelity.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Develop and test component technology concepts used in conventional aircraft configurations that establish the feasibility of achieving Stage 3 - 42 EPNdb (cumulative) noise reduction.	None	6AT8 White	None	**8AT07 Green**
Develop and test component technology concepts for unconventional aircraft configurations that establish the feasibility of achieving short take-off and landings on runways less than 3000 feet.	None	None	None	**8AT08 Green**
Validate model engine stall control concepts using component test data obtained in test cell CE18 in order to extend rotorcraft engine operability range.	None	None	7AT4 Green	**8AT09 Green**
Develop a rotorcraft model, validated with data from gear noise and vibration testing, to predict reductions in gear vibration transmission.	None	6AT8 White	None	**8AT10 Red**
Demonstrate a composite supersonic engine fan blade containment system that is 20 percent lighter than the High Speed Research Program metallic containment system and validate through laboratory tests.	None	None	None	**8AT11 Yellow**
Demonstrate a high fidelity analysis technique for assessing the impact of nozzle plume effects on the off body flow field of a supersonic aircraft and validate predicted results within 5 percent of flight data.	None	None	7AT4 Green	**8AT12 Green**
Characterize multi-functional advanced ablator systems in arcjet facilities to provide a database for material degradation models for hypersonic vehicles.	None	None	None	**8AT13 Green**
Evaluate state-of-the-art hypersonic flight simulation tools, ablator systems, and GNC technologies using data from sub-orbital SOAREX flight 1.	None	None	7AT4 Green	**8AT14 Red**

Why NASA did not achieve APG 8AT10: The researcher at the Glenn Research Center responsible for technical activities related to this milestone retired at the end of 2007. The highly specialized skill required for modeling of gear noise and vibration was not readily available to conduct research in-house.

Plans for achieving 8AT10: SRW decided to conduct this research through an NRA. In 2008, NASA competitively selected two universities, Ohio State University and Penn State University, through the NRA process to conduct research on gear noise and vibration modeling. The milestone will be complete in 2010.
Why NASA did not achieve APG 8AT11: The vendor responsible for the scaled structural sub-elements for the High Speed Research Program had planned to manufacture and test the elements by the 3rd week of September 2008. A carbon fiber supply chain backlog and a widespread power outage in southwestern Ohio delayed the manufacturing of the elements.

Plans for achieving 8AT11: NASA expects to receive the elements sometime in November 2008. Once NASA receives the elements, testing will be completed in a week. Assuming a positive outcome from the test, the milestone will be completed with at the end of November 2008.

Why NASA did not achieve APG 8AT14: The Hypersonic Boundary Layer Transition (HyBoLT) and Sub-Orbital Aerodynamic Re-entry Experiments (SOAREX) were part of the payload on an experimental rocket, ALV-XI, developed by ATK. The rocket with its two payloads was launched from Wallops Flight facility on August 22 and was destroyed less than 30 seconds after liftoff when the rocket failed to align its trajectory on the correct flight path. The HyBoLT payload transmitted 20.5 seconds of data; however, the rocket did not reach Mach 2, which is the required speed for the experiment. It is not known whether the data will be useful but HyBoLT's sensors were working and recording data. HyBoLT would have transmitted approximately 75 seconds of data had the rocket not been destroyed. The SOAREX experiment was separated from the rocket during the incident and obtained 10 seconds of data. The usefulness of these data is unknown. SOAREX was not designed to operate until HyBoLT had separated from the rocket.

Plans for achieving 8AT14: Both HyBoLT and SOAREX tests were designed to obtain relevant data under hypersonic flight conditions, which cannot be obtained in ground tests. The Hypersonics project will pursue other flight test opportunities through partnerships with other government agencies and organizations. An example is partnership with the Air Force on the Hypersonic International Flight Research Experiments (HIFIRE) program, in which NASA is a partner for three of the HIFIRE flights. These flight experiments will provide critical boundary layer transition, mode transition, and aerothermal heating data under hypersonic flight conditions, which will be used to validate models developed by NASA.

Outcome 3E.4: Ensure the continuous availability of a portfolio of NASA-owned wind tunnels/ground test facilities, which are strategically important to meeting national aerospace program goals and requirements.

FY05	FY06	FY07	FY 2008
None	None	None	**Green**

ATP invested approximately $48 million in its first three years of execution on facility maintenance and upgrade projects to improve reliability and to ensure the availability of its portfolio of NASA-owned wind tunnels and ground test facilities.

ATP worked with the NASA Centers to establish a clear and consistent pricing structure and charging policy for wind tunnel testing across the board. This approach assists test customers in their cost estimating activities and long-term test planning.

As part of its continuous efforts to improve facility operational efficiencies, ATP initiated the National Force Measurement Technology Capability, to address the severe erosion of NASA's capability to utilize strain gage balances in wind tunnel testing. ATP will formalize the management of this critical testing technology in early FY 2009.

ATP worked with several organizations and sponsored or co-sponsored several working group meetings to promote the National Aeronautics Research and Development Policy and to foster effective partnerships and working relationships.

NASA representatives also attended the second and third National Partnership for Aeronautical Testing (NPAT) council meetings that convened in Alexandria, Virginia, and Washington, DC. The NPAT council is working to establish the foundation for a national aeronautics testing facility strategy.

FY 2008 Annual Performance Goal	FY05	FY06	FY07	FY 2008
Develop maintenance and investment strategy for NASA owned wind tunnels/ground test facilities to ensure their long-term health and operational availability.	None	None	7AT7 Green	**8AT15 Green**

FY 2008 Annual Performance Goal	FY05	FY06	FY07	FY 2008
Develop a long-term, aeronautic test facility vision and funded plan working with all the appropriate stakeholders, to assure that the plan reflects the priorities of the long-term needs of the Nation.	None	None	None	**8AT16 Yellow**

Why NASA did not achieve APG 8AT16: NASA did not achieve APG 8AT16 due to program management changes in the second quarter of FY 2008. The incoming program manager made several visits to the Dryden Flight Research Center during the second and third quarter to understand the issues and opportunities for NASA flight-testing and this new understanding resulted in a management decision to engage the RAND Corporation for support in developing a new strategic plan.

Plans for achieving APG 8AT16: ATP awarded a contract to the RAND corporation in the fourth quarter FY 2008 for this effort and the scheduled completion is during the second quarter FY 2009.

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.

	Green	Yellow	Red	White
3 Outcomes	3	0	0	0
9 APGs	5	4	0	0

Expenditures (In Millions of Dollars)
$256

Responsible Mission Directorate

Exploration Systems (ESMD)

Contributing Theme

Advanced Capabilities

Theme Description

The Advanced Capabilities Theme provides knowledge, technology, and innovation that will enable current and future exploration missions, as outlined in NASA's Strategic Plan. The Acvanced Capabilities programs and their projects provide knowledge as a result of ground based research and technology development, research conducted in space, and observations from robotic flight missions. Advanced Capabilities also develops and matures advanced technology, integrates that technology into prototype systems, and transitions knowledge and technology to the Constellation Program.

PART Assessment Rating

Theme	Last Year Assessed	Overall Rating	Program Purpose and Design	Strategic Planning	Program Management	Program Results/ Accountability
Advanced Capabilities	2007	Adequate	100%	90%	75%	45%

When astronauts return to the Moon and journey to further destinations, they will be subjected to the microgravity, radiation, and 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. Through a combination of ground- and space-based research, 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 developing 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.

Benefits

The medical knowledge and diagnostic and treatment technologies NASA uses to keep humans healthy and productive in space can 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 help 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.

Over the years, companies have taken NASA life-support and medical technologies, produced by this and other NASA programs, and have 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 Space 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/.

Risks to Achieving Sub-goal 3F

A major challenge in completing all the planned experiments that require long-duration spaceflight is the availability of flight opportunities to conduct research on crew and associated systems.

FY 2009 Performance Forecast

- Exploration Medical Capability will develop technology that will allow NASA to meet the level of care standards for space exploration missions including: rapidly deployed extravehicular activity (EVA) sensors, medical-grade water production system, ventilation system that uses cabin oxygen instead of stored oxygen, capability to analyze blood and saliva-borne biomarkers, and tools for medical decision-making during exploration missions.
- Space Human Factors and Habitability (SHFH) will primarily use ground based analog models to optimize human systems performance in the design of the Orion Crew Exploration Vehicle and other exploration vehicles. SHFH will also evaluate human toxicity of long-term exposure to lunar dust and develop food-packaging systems to ensure safe storage and delivery of food on long-term missions.
- Behavioral Health and Performance will undertake ground-based analog and ISS flight-based studies to evaluate contributing factors to health or performance degradation, errors, and/or failures during critical mission operations. These studies will evaluate sleep loss and circadian rhythm, medication side effects, fatigue, team cohesion, and training protocols.
- The Avionics and Software project will develop a Solid Rocket Motor health monitoring system for the Ares 1 first stage.
- The Crew Support and Accommodations project will develop lightweight oxygen tanks and an oxygen recharge system for spacesuits.
- The Structures, Materials, and Mechanisms project will develop lightweight, high-strength fabrics to reduce the stowed volume of the Orion main parachutes.
- Instrument and subsystem integration and testing were the primary FY 2008 activities for both the LRO and LCROSS missions, with final preparation for launch in FY 2009. LCROSS will complete its mission by impacting the lunar surface, investigating the possible presence of water in a permanently shadowed crater.

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

FY05	FY06	FY07	FY 2008
None	3F.1 Green	3F.1 Green	**Green**

NASA's Human Research Program (HRP) and Exploration Technology Development Program (ETDP) will enable long-duration human space missions through their efforts to understand and lessen the harmful effects of the space environment on humans and to develop new technologies that reduce mission resource requirements.

The Institute of Medicine of the National Academies completed an external review of risks to human health in space for HRP and developed an Integrated Research Plan that prioritizes these risks and associated research gaps. One of the main risks to astronauts during long-duration spaceflights is the formation of kidney stones due to accelerated bone loss. NASA conducted the Renal Stone experiment on the ISS to test the effectiveness of potassium citrate in preventing kidney stone formation during long-duration spaceflight. The results of the experiment are available on the ISS science Web site: http://www.nasa.gov/mission_pages/station/science/experiments/Renal-Stone.html.

A study of the ability of low amplitude vibration delivered through the feet to preserve bone density and strength was completed at the NASA/National Institutes of Health bed-rest facility. Two 90-day human bed-rest campaigns with 18 subjects tested two different intensities of vibration. Results in this study found no statistically significant difference between subjects who received the treatment and subjects who did not. For missions to the Moon, lunar dust will present challenges to astronaut respiratory systems and skin during lengthy environmental contact. HRP characterized the size range of inhalable lunar dust, and began to test the toxicity of various inhalable-size particles. Dermal studies performed in collaboration with the National Institute of Occupational Safety and Health (NIOSH) showed the ability of larger grains of dust to harm human skin. Chemical activation studies performed with NIOSH showed that lunar dust remains reactive for several hours, depending on environmental conditions.

The Stability of Pharmacotherapeutic and Nutritional Compounds (Stability) experiment is studying the effects of the space flight environment on the complex organic molecules, vitamins, and other compounds found in food and medicine.

Anecdotal information suggested that pharmaceuticals lost their effectiveness during long-duration missions. For the experiment, NASA delivered four identical Stability experiment kits to the ISS in July 2006. The first kit was returned to Earth in 2006. The second kit was returned in June 2007 after 11 months of exposure. The third kit was returned in February 2008 after one year and seven months of exposure. The plan is to analyze the kits as they return over the two-year period to ascertain the chemical stability of the food and medicine. After the fourth kit is returned in November 2008, the researchers will analyze this last kit and publish their findings.

A complete list of ISS research experiments by Expedition is available at http://www.nasa.gov/mission_pages/station/science/index.html.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Complete development of a renal stone countermeasure and validate it for use.	None	6HSRT9 Yellow	7HSRT1 Green	**8AC05 Yellow**
Complete study of a non-pharmacological countermeasure for bone loss in a spaceflight analog environment.	None	None	None	**8AC06 Green**
Characterize the size distribution of lunar dust (from Apollo samples) in the inhalable size range (<10 micrometers), and begin toxicity testing with simulated lunar dust.	None	None	None	**8AC07 Green**
Determine the stability of a controlled set of food/nutritional items and common medications, representative of the types and classes typically provided on space missions, after six months exposure to the space flight environment.	None	None	None	**8AC08 Yellow**

Why NASA did not achieve APG 8AC05: NASA completed the experiment and results are on the ISS Web site, but the study has not yet been submitted for journal publication. This is due to the need for a human system risk board to occur in order to assess operational utility. This risk board meets on a regular basis to discuss human research findings with medical operations.

Plans for achieving 8AC05: Project scientists will submit the results for publication in peer reviewed journals and present at national meetings after the human system risk board's assessment in the first quarter of 2009.

Why NASA did not achieve APG 8AC08: The fourth kit of food/nutritional items and common medications is still in orbit. The other three have landed and have been analyzed.

Plans for achieving 8AC08: The fourth kit will land in the first quarter of FY 2009 and then will be analyzed to complete the requirements of this APG.

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

FY05	FY06	FY07	FY 2008
8.7 Green	3F.2 Green	3F.2 Green	**Green**

Reliable life support systems are essential to maintain a comfortable and healthy environment on space missions. While effective, current systems consume significant resources and are not practical or cost-effective for long-duration missions beyond low Earth orbit. NASA is on track with the Carbon-dioxide and Moisture Removal Amine Swing-bed, which will remove moisture and carbon dioxide from inside the Orion crew capsule, the Altair lunar lander, and lunar rovers. The single system replaces two larger units, reducing mass and volume. The system also reduces power by using the vacuum of space to remove both carbon dioxide and moisture, reducing the need for heaters to eliminate carbon dioxide and moisture from the unit. Testing on the device began more than a year ago. In FY 2008, tests placed volunteers inside a test chamber scaled to the size of the Orion crew capsule, where they worked, slept, ate, and exercised as they would on a mission. The system operated as hoped during the tests, producing good air quality and temperature control. Two additional testing phases are planned in the near future. More on the system, including video of the tests, is available at http://www.nasa.gov/mission_pages/constellation/main/camras.html.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Deliver two prototype life support systems: the Carbon Dioxide and Moisture Removal Amine System (CAMRAS); and the Sorbent Based Air Revitalization (SBAR) System.	None	None	7HSRT3 Green	**8AC09 Yellow**

Why NASA did not achieve APG 8AC09: The third CAMRAS unit has not yet been delivered due to issues that arose during fabrication.

Plans for achieving 8AC09: The third CAMRAS unit is scheduled to be delivered in November 2008. The other two units have already been delivered.

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

FY05	FY06	FY07	FY 2008
None	3F.3 Green	3F.3 Green	**Green**

NASA advanced development of two environmental monitoring instruments during FY 2008: the Electronic Nose, an event monitor that will give early warning signals of an anomaly in the ISS environment, and the Vehicle Cabin Atmosphere Monitor (VCAM), a gas chromatograph-mass spectrometer that will provide detailed analysis of the ISS atmosphere. NASA will launch the Electronic Nose to the ISS in November 2008 on the ULF-2 mission. The VCAM instrument is scheduled for launch in mid 2009. The Exploration Systems Mission Directorate developed these instruments in concert with the Space Operations Mission Directorate's ISS Program to incorporate the monitoring needs for crew health.

In addition to atmospheric monitoring, the development of strategies to detect, suppress, and prevent fires is equally important. The completion of the Smoke and Aerosol Measurement Experiment (SAME) on the ISS in October 2007 offers new insight into smoke and particulate behavior in microgravity and will aid in developing fire safety procedures and monitors. Experiments conducted on-board the ISS will provide data necessary to ensure reliable detection of developing spacecraft fires, should one occur during an exploration mission. The Glenn Research Center completed development of the Fluids and Combustion Facility, an ISS rack that will facilitate research in fluids and combustion, including research for fire detection and control. Glenn delivered the facility to Kennedy Space Center, where it will be launched to the ISS.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Deliver the Vehicle Cabin Atmosphere Monitoring (VCAM) flight hardware in preparation for launch to ISS.	None	None	7HSRT4 Green	**8AC10 Yellow**
Deliver the Electronic Nose (E-Nose) flight hardware in preparation for launch to ISS.	None	None	None	**8AC11 Green**
Launch the Smoke Aerosol Measurement Experiment (SAME) to ISS and initiate testing.	None	None	7HSRT5 Green	**8AC12 Green**
Deliver the Combustion Integrated Rack (CIR) and its insert, the Flame Extinguishment Experiment in preparation for launch to ISS.	None	None	7HSRT5 Green	**8AC13 Green**

Why NASA did not achieve APG 8AC10: There is a high degree of uncertainty in availability of payload opportunities for a February 2009 launch. The likelihood of available opportunities is higher for a July 2009 launch.

Plans for achieving 8AC10: NASA may move the Pre-Ship Review date from September 30, 2008, to no later than December 15, 2008, and the additional time prior to shipment will be used for further characterization of VCAM performance. This characterization will improve understanding and confidence of on-orbit behavior.

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

	Green	Yellow	Red	White
2 Outcomes	1	1	0	0
7 APGs	4	2	0	1

Expenditures (In Millions of Dollars)
$3,845

Responsible Mission Directorate

Exploration Systems (ESMD)

Contributing Theme

Constellation Systems

Theme Description

The Constellation Systems Theme develops new systems, initially outlined by the Exploration Systems Architecture Study, to support the International Space Station and enable sustainable and affordable human exploration of the Moon, Mars, and beyond.

PART Assessment Rating

Theme	Last Year Assessed	Overall Rating	Program Purpose and Design	Strategic Planning	Program Management	Program Results/ Accountability
Constellation Systems	2006	Adequate	100%	78%	75%	40%

Strategic Goal 4 is essential to achieving NASA's Mission. 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. To achieve the long-term objective of returning explorers to the Moon and eventually sending them to Mars, NASA initiated the Constellation Program to achieve Strategic Goal 4, developing new space transportation capabilities. So far, the program includes the Orion Crew Exploration Vehicle, the expendable crew launch vehicle Ares I, the heavy-lift cargo launch vehicle Ares V, 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 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.

Benefits

Orion will support the expansion of human exploration missions and provide the means to take humans to the Moon 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 wind down, Shuttle personnel will find new, challenging positions working on Constellation development efforts, keeping this highly skilled segment of America's workforce productive and competitive. Constellation 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.

Risks to Achieving Strategic Goal 4

The Constellation Program is striving to meet challenges in the management and technical areas. The Constellation Program must manage its development work such that it remains within its constrained budget while also meeting the

externally committed milestones of exploration. In the technical arena, the Constellation Program also has some engineering challenges very similar to many NASA encountered during the Apollo Program and development of the Space Shuttle. Every time NASA faces an engineering challenge, Agency engineers examine all the options for addressing the issue. NASA has an excellent track record of resolving technical challenges and is expecting to resolve any technical issues and meet the Exploration Systems milestones.

FY 2009 Performance Forecast

- Major elements of the Constellation Program will complete formulation in FY 2009 and move into implementation. Development activities will be marked by such events as the completion of the flight project Preliminary Design Review (PDR) for the Ares I projects (completed in FY 2008). Completion of the flight project PDR allows the Constellation Program Integrated Stack PDR to begin in early FY 2009, which will verify that the flight project is ready to proceed. FY 2009 also will include PDR activities for Operational Capabilities, which includes Ground Operations, Mission Operations, and Extravehicular Activity (EVA) Systems. Late in FY 2009, the Constellation Program will then convene the Operational Capabilities PDR board.

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.

FY05	FY06	FY07	FY 2008
7.1 Green	4.1 Green	4.1 Yellow	**Yellow**

Development activities for the Constellation Program in FY 2008 included the completion of all project Systems Definition Reviews (SDRs) and Preliminary Non-Advocate Reviews (PNARs) for Ares 1, Orion, Ground Operations, and Mission Operations, which gave approval for all projects to move towards PDRs. A completed PDR means that the project has adequately defined its goals, and requirements and can begin the design of hardware and systems. The Constellation Program already has moved some hardware from drawings into production and testing, including parachute, wind tunnel, and engine component testing. In addition, the Orion Crew Exploration Vehicle project completed fabrication of the Crew Module for the Pad Abort 1 Test. The Pad Abort 1 Test is one of a series of tests to develop the Launch Abort System, which is a system to keep the crew safe during the launch phase. Although progress is being made, Constellation has not completed the Orion and EVA PDRs, yielding a Yellow for the associated APGs.

Why NASA is not on track to achieve Outcome 4.1 as stated: Prior milestones need to be completed before the Orion and EVA PDRs are held.

Plans for achieving Outcome 4.1: The SDRs and PNARs gave approval for the Ares 1, Orion, Ground Operations, and Mission Operations projects to proceed toward PDR. The EVA Systems project is underway to complete its PNAR in early FY 2009. As a result of several Government Accountability Office (GAO) bid protests concerning the award of the Constellation Space Suit System (CSSS) prime contract and the subsequent termination of that contract in FY 2008, NASA is in the process of taking corrective action with this procurement and will be updating its project milestones to accommodate the delay in the award of the CSSS contract, including rescheduling its PDR and subsequent internal technical reviews.

FY 2008 Annual Performance Goal	FY05	FY06	FY07	FY 2008
Complete the Preliminary Design Review (PDR) for the Orion/Crew Exploration Vehicle (CEV).	None	6CS2 Green	7CS2 Yellow	**8CS01 Yellow**
Complete the Critical Design Review (CDR) for Ares I-1 flight demonstration.	None	None	None	**8CS02 Green**
Complete the Preliminary Design for the Ares-I/Crew Launch Vehicle.	5TS3 Green	6CS3 Green	7CS3 Yellow	**8CS03 Green**
Complete the Critical Design Review (CDR) for the ground infrastructure/systems at the launch site.	None	None	None	**8CS04 White**
Complete the System Design Review (SDR) for mission operations infrastructure and systems.	None	None	None	**8CS05 Green**
Complete the Preliminary Design Review (PDR) for the Extravehicular Activity (EVA) Systems.	None	None	None	**8CS06 Yellow**

Why NASA did not achieve APG 8CS01: NASA did not achieve the APG due to the refinement in the deliverable schedules since the time these metrics were established. These metrics were established when the project was still in early formulation.

Plans for achieving 8CS01: Since establishment of these goals, NASA refined the Orion project schedule and shifted the PDR to align with the new program milestones. The Orion project continues to perform Design Analysis Cycles that will lead to the PDR currently scheduled for FY 2009.

Why NASArated APG 8CS04 White: The completion of the Ground Operationss CDR during this reporting period was erroneously established as an APG for FY 2008. The current project schedule is essentially unchanged and currently provides for Project CDR in October 2010. In support of this schedule, NASA completed the project SDR as scheduled in May 6, 2008, and the PDR is scheduled for November 2008.

Why NASA did not achieve APG 8CS06: NASA established these metrics when the EVA Systems project was still in early formulation. Since then, the project found it necessary to refine its schedule during the reporting period by shifting the PDR to align with new program milestones. In addition, in response to several protests filed by the Exploration Systems and Technology LLC (EST)—the unsuccessful offeror—with the GAO between contract award on June 12 and September 29, 2008, NASA notified the GAO that it determined that "corrective action" was appropriate and, as part of the corrective action, NASA terminated the original CSSS contract awarded to Oceaneering International, Inc. (OII) for the convenience of the government, The GAO then dismissed the original EST protest and all supplemental protests as "academic," given NASA's decision to take corrective action.

Plans for achieving 8CS06: NASA is implementing a corrective action plan and will update its key project milestones accordingly to accommodate that plan. NASA is replanning the EVA Systems project preliminary design efforts to accommodate the delay. Although the GAO protests have been dismissed, Federal acquisition regulations still prohibit NASA from discussing details about a pending procurement matter.

Outcome 4.2: By 2010, successfully transition applicable Shuttle components, infrastructure, and workforce to the Constellation Systems program.

FY05	FY06	FY07	FY 2008
None	4.2 Green	4.2 Green	**Green**

ESMD continued work to transition Space Shuttle infrastructure and workforce to the Constellation Program. ESMD has outlined the strategy and performance for each part of the Space Shuttle transition and retirement in a series of reports: the NASA Transition Management Plan; the NASA Workforce Transition Strategy Initial Report; and the Human Spaceflight Capabilities Forum 2 Meeting Report.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Demonstrate progress towards the transition of Space Shuttle and International Space Station Infrastructure for utilization in Constellation Systems, including transfer of Mobile Launch Platform 1.	None	None	None	**8CS07 Green**

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

	Green	Yellow	Red	White
3 Outcomes	3	0	0	0
6 APGs	5	1	0	0

Expenditures (In Millions of Dollars)
$314

Responsible Mission Directorate	Contributing Theme	Theme Description
Exploration Systems (ESMD)	Constellation Systems	The Constellation Systems Theme develops new systems, initially outlined by the Exploration Systems Architecture Study, to support the International Space Station and enable sustainable and affordable human exploration of the Moon, Mars, and beyond.
Space Operations (SOMD)	Space and Flight Support (SFS)	Space and Flight Support includes Space Communications and Navigation, Launch Services, Rocket Propulsion Testing, and Crew Health and Safety. These programs are essential for conducting human and robotic space exploration, aeronautical research, and biological and physical research. They provide services to a wide range of customers, including NASA scientists and engineers, other federal agencies, universities, foreign governments, and industry.
Cross-Agency Support Programs (CASP)	Innovative Partnerships Program (IPP)	The IPP Theme provides leveraged technology for NASA's programs through partnerships with industry, academia, other government industries, and national laboratories. The resulting technologies benefit NASA's Mission while also having strong potential transfer to commercial application and public benefit.

PART Assessment Rating

Theme	Last Year Assessed	Overall Rating	Program Purpose and Design	Strategic Planning	Program Management	Program Results/ Accountability
Constellation Systems	2006	Adequate	100%	78%	75%	40%
Space and Flight Support	2007	Moderately Effective	100%	100%	88%	61%
Innovative Partnerships	2008	Moderately Effective	100%	100%	89%	61%

The objective of Strategic Goal 5 is to acquire launch services and technologies that enable NASA's robotic and human missions. NASA's robotic missions are launched on commercial vehicles acquired by Space and Flight Support. And as the Space Shuttle nears retirement, NASA is interested in International Space Station (ISS) cargo delivery and return services provided by emerging domestic launch service companies.

Benefits

Since NASA's creation in 1958, the commercial sector has been an important Agency partner in space exploration. NASA purchases launch services 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. To encourage this emerging sector of the space industry, ESMD has adopted a Commercial Development Policy that will be used as a basis for an Agency-level policy. Programs and projects, such as Commercial Orbital Transportation Services (COTS) and Centennial Challenges (both described in more detail below) are examples of this policy already being implemented within the Agency. By helping emerging companies 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 seeks to stimulate the emerging U.S. entrepreneurial launch sector and accelerate the growth of the commercial space business by maximizing industry's ability to retain intellectual property rights and awarding prizes 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 FY 2006, NASA selected a portfolio of two emerging aerospace companies to demonstrate orbital cargo transportation services through the COTS project. The Agency later added to its portfolio by signing unfunded Space Act Agreements with other companies.

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.

Risks to Achieving Strategic Goal 5

Using Alternative Launch Providers presents potential increased risk to the Agency because the companies' launch systems are unproven. NASA needs to balance the need to encourage emerging companies against the need to carry out Agency missions with limited risk. In 2007, the Launch Services Program (LSP) completed an Agency strategic review of options for expendable launch vehicles in the medium performance class. A key recommendation accepted by the Agency is to give significant attention to enabling the Alternative Launch Provider community in becoming certified for NASA use. LSP also coordinated an Agency review of NASA Policy Directive 8610.7 "Launch Services Risk Mitigation Policy for NASA-Owned and/or NASA-Sponsored Payloads/Missions" to evaluate the feasibility of changes to Agency policies to enable the use of emerging launch service providers sooner. The policy elements reviewed included the number of demonstrated successful launches required for certification, and was modified to eliminate the requirement for the launch service provider to have a previously certified launch vehicle under certain certification alternatives. The policy mitigates risk by balancing the level of NASA technical insight into the launch systems with demonstrated launch success. These changes recognize the current industry market and what steps are required for certification. There is no guarantee that new providers will be ready and certified when needed for NASA missions.

The successful implementation of commercial services involves detailed technical work needed to successfully integrate private sector vehicles and NASA systems. With funded and unfunded partners onboard for the COTS project, NASA and its partners are working closely to ensure that the communications, docking or berthing, operational, and navigational interfaces are well planned and the technical requirements well understood. In addition, the commercial partner services must prove, through the ISS safety panel process, that their system is sufficiently safe in order to be allowed to approach the station.

Another challenge is that the commercial space market remains weak, suppliers continue to struggle, and costs continue to rise as evident by the failure of one of NASA's funded partners to perform in accordance with their Space Act Agreement, resulting in their subsequent termination. The loss of a partner narrows the field of options for success, thus NASA conducted a competition in early FY 2008 to bring on an additional funded partner or partner.

NASA faces issues with all classes of launch services. Small class missions may have competition and will struggle for cost effective launch services. There are no near-term replacements for medium class launch services and while the COTS effort may bring future launch capability, satellite constellation replenishments such as ORBCOMM, Iridium, and Globalstar will not likely be supplied from U.S. launch service providers.

FY 2009 Performance Forecast

- LSP will manage the successful commercial launch of nine planned mission launches for FY 2009: IBEX, OCO, Glory, WISE, Kepler, LRO/LCROSS, NOAA-N Prime, STSS Demonstrators (DEMO), STSS Advanced Technology Risk Reduction (ATRR), and GOES.
- The Rocket Propulsion Testing (RPT) program will continue to test facility management, maintenance, sustaining engineering, operations, and facility modernization projects required to keep the test-related facilities in the appropriate state of operational readiness and will continue to be funded. Established testing requirements for the exploration program will be used to identify excess and "at-risk" test facilities and will support decisions relative to test asset consolidation initiatives. RPT's inventory of 32 test stands, ranging from active to mothballed facilities, will continue to be maintained at various states of operational readiness as required. Propulsion test technology development will also be continued.

- The Commercial Crew and Cargo Program Office will focus on the successful continuation of the Space Act Agreements of the COTS partners, culminating in an orbital flight demonstration by at least one partner and progress being demonstrated by the other funded and unfunded partners.
- IPP plans to develop at least 12 technology-related significant partnerships that create value for NASA programs and projects; complete at least 30 technology transfer agreements with the commercial and academic community through licensing, software use agreements, facility use agreements, and Space Act Agreements.

Outcome 5.1: Develop and demonstrate a means for NASA to purchase launch services from emerging launch providers.

FY05	FY06	FY07	FY 2008
17.1 Green	5.1 Green	5.1 Green	**Green**

NASA implemented the Facilitated Access to the Space Environment for Technology Demonstration and Training (FAST) project to better enable researchers to test new technologies in reduced-gravity conditions on commercial parabolic aircraft flights (which simulate the effects of being weightless) and eventually on commercial sub-orbital flights. IPP facilitated seven NASA Small Business Innovative Research (SBIR) technology tests in September 2008 aboard a commercial aircraft, and flew five in a flight-week shortened by Hurricane Ike. The Agency will release a broad call for technology demonstrations in FY 2009.

LSP continues to open the bidding process to a larger number of launch providers, in an effort to help the emerging commercial space sector gain experience to successfully compete for future missions. In March 2008, LSP established the NASA Launch Services (NLS) Contract Follow-on Procurement Development Team. In April 2008, the PDT released a Request for Information to the launch service industry for NASA's Small and Medium Class mission model. Responses have been received and are being evaluated. Space Exploration Technologies (SpaceX) was placed onto the NLS contract in April 2008 to include Falcon 1 and Falcon 9 launch services. LSP also has entered into one unfunded Space Act Agreement and is pursuing a second with companies that are actively funding new launch vehicles. The companies will share information with LSP that could aid in future certification efforts in return for LSP's advice and guidance on the development of the launch vehicle.

FY 2008 Annual Performance Goal	FY05	FY06	FY07	FY 2008
Demonstrate purchase of services from the emerging commercial space sector for microgravity research and training. (Purchase of services will be at a 40% reduced level from planned per the FY08 budget request.)	None	None	None	**8IPP05 Green**
Realize competitive rates from emerging U.S. launch providers and open the bidding process to a larger number of launch providers.	None	None	7SFS4 Green	**8SFS01 Green**

Outcome 5.2: By 2010, demonstrate one or more commercial space services for ISS cargo and/or crew transport.

FY05	FY06	FY07	FY 2008
17.1 Green	5.2 Green	5.2 Green	**Green**

NASA's COTS project is an investment by NASA to spur development of a cost-effective, U.S. commercial capability to carry cargo to the ISS, with future options for transporting crew. The COTS project currently has funded Space Act Agreements with two partners, SpaceX and Orbital Sciences Corporation (OSC). NASA selected Orbital in February in a second round competition for the COTS funding. The performance commitment in FY 2008 was to complete all negotiated deliverables for both funded Space Act Agreements. SpaceX and Orbital continue to make progress towards Outcome 5.2 by completing the agreed-upon milestones leading up to the on-orbit flight demonstrations planned for 2010. SpaceX completed all six milestones outlined in their agreement for FY 2008, including the Preliminary Design Review for the third demonstration flight to the ISS and a multi-engine test firing of all nine engines, which is planned for the Falcon 9 launch vehicle. Orbital completed a Program Plan Review and a System Requirements Review and is on track to meet the other milestones scheduled for this year. NASA continues to support unfunded agreements with companies who are also planning to develop commercial space transportation capabilities. NASA should achieve Outcome 5.2 as both partners are still on track to meet the planned deliverables in the next two years leading up to the on-orbit demonstration in 2010.

FY 2008 Annual Performance Goal	FY05	FY06	FY07	FY 2008
Complete the Flight Demonstration 1 Readiness Review leading up to demonstration flights in FY 2009.	None	None	None	**8CS08 Yellow**
Complete the Flight Demonstration 2 Preliminary Design Review (PDR) leading up to demonstration flights in FY 2009.	None	None	None	**8CS09 Green**
Complete the Flight Demonstration 3 System Requirements Review (SRR) leading up to demonstration flights in FY 2009.	None	None	None	**8CS10 Green**

Why NASA did not achieve APG 8CS08: In an effort to enable commercial success in this high-risk venture, NASA has negotiated the agreement timeline at the request of one of the COTS partners.

Plans for achieving 8CS08: The flight Demonstration 1 Readiness Review is delayed until March 2009, and NASA expects that the long-term goals of the program will be met.

Outcome 5.3: By 2012, complete one or more prize competitions for independently designed, developed, launched, and operated missions related to space science or space exploration.

FY05	FY06	FY07	FY 2008
None	None	5.3	**Green**

In 2008, the Centennial Challenges Program completed five competition events in each of the following prize categories: Beam Power, Tether, Regolith Excavation, Lunar Lander, and General Aviation Technology. Among these competitions, NASA awarded $97,000 at the General Aviation Technology Challenge for general aviation aircraft technologies concerning safety, short take off distance, low cabin noise, and low community noise. The competing teams made improvements to their aircraft specifically to meet challenge requirements. The rules for the challenge were posted in December 2007, giving competition teams only seven months to prepare. Despite this short notice, several teams competed, and NASA expects that future General Aviation Technology Challenges will yield exciting technology innovations. One team that did not compete, because their aircraft was not ready to fly, exhibited a significant technology innovation designed for the competition: a turbocharger using bio-diesel, a fuel made from renewable vegetable oil that is shown to emit fewer harmful exhaust emissions than petroleum-based diesel. Aircraft companies around the world, including Boeing, Virgin Atlantic, and GE Aviation, have been studying the viability of aircraft fueled by bio-diesel.

A prize challenge is considered "complete" when the program has successfully conducted the planned number of competition events, whether or not a team/individual competitor has won the prize money.

FY 2008 Annual Performance Goal	FY05	FY06	FY07	FY 2008
Demonstrate benefits of prize competitions by awarding at least one prize and communicating the results technology advancements.	5HRT17 Blue	None	7ESRT3 Green	**8IPP06 Green**

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

	Green	Yellow	Red	White
5 Outcomes	4	1	0	0
9 APGs	4	3	0	2

Expenditures (In Millions of Dollars)
$877

Responsible Mission Directorate	Contributing Theme	Theme Description
Exploration Systems (ESMD)	Constellation Systems	The Constellation Systems Theme develops new systems, initially outlined by the Exploration Systems Architecture Study, to support the International Space Station and enable sustainable and affordable human exploration of the Moon, Mars, and beyond.
	Advanced Capabilities	The Advanced Capabilities Theme provides knowledge, technology, and innovation that will enable current and future exploration missions, as outlined in NASA's Strategic Plan. The Acvanced Capabilities programs and their projects provide knowledge as a result of ground based research and technology development, research conducted in space, and observations from robotic flight missions. Advanced Capabilities also develops and matures advanced technology, integrates that technology into prototype systems, and transitions knowledge and technology to the Constellation Program.
Space Operations (SOMD)	Space and Flight Support (SFS)	Space and Flight Support includes Space Communications and Navigation, Launch Services, Rocket Propulsion Testing, and Crew Health and Safety. These programs are essential for conducting human and robotic space exploration, aeronautical research, and biological and physical research. They provide services to a wide range of customers, including NASA scientists and engineers, other federal agencies, universities, foreign governments, and industry.

PART Assessment Rating

Theme	Last Year Assessed	Overall Rating	Program Purpose and Design	Strategic Planning	Program Management	Program Results/ Accountability
Constellation Systems	2006	Adequate	100%	78%	75%	40%
Advanced Capabilities	2007	Adequate	100%	90%	75%	45%
Space and Flight Support	2007	Moderately Effective	100%	100%	88%	61%

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 is leveraging 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.

NASA is 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.

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 (ISS), and robotic spacecraft.

Risks to Achieving Strategic Goal 6

As the name suggests, the Advanced Capabilities Theme develops new, advanced technologies for NASA's robotic and human exploration missions. Many of the projects conducted by the Advanced Capabilities's Exploration Technology Development Program (ETDP) are either in formulation or early stages of development. As such, they are subject to challenges that affect any project in its early stages:

- Reductions in planned budget may prevent technologies from being matured in time to support preliminary design of flight systems;
- The evolving lunar architecture may cause technology development priorities to change; and
- Technologies may be more difficult to develop to the required level of maturity than originally anticipated.

To mitigate these risks, NASA is conducting follow-on studies to the Exploration Systems Architecture Study. Through this process, NASA continues to: adjust the exploration architecture based on budget constraints, technology readiness levels, and probable capabilities; reassess technology needs and refocus research and development based on study findings; and strategically plan for near- and long-term needs, creating a balanced portfolio of medium- to high-maturity technologies required by current missions and higher-risk technologies that may not have immediate mission applications but would enable future missions.

FY 2009 Performance Forecast

- Late in FY 2009, the Constellation Program will convene the operational capabilities Preliminary Design Review (PDR) Board. Instrument and subsystem integration and testing were the primary FY 2008 activities for both LRO and LCROSS, with final preparation for launch late in FY 2009. LCROSS is currently scheduled to complete its mission by the end of the first quarter of 2010 by impacting the Lunar surface, investigating the possible presence of water in a permanently shadowed crater.
- The Space and Communications and Navigation Program's (SCaN's) major goals will be to provide support to all missions, conduct the Tracking and Data Relay System (TDRS-K/L) PDR/ Non-Advocacy Review, and deliver the software Defined Radio Test Bed payload to the Space Transportation System for launch in 2010.

Outcome 6.1: By 2008, launch a Lunar Reconnaissance Orbiter (LRO) that will provide information about potential human exploration sites.

FY05	FY06	FY07	FY 2008
None	6.1 Green	6.1 Green	**Yellow**

To enable a successful lunar return program, the characteristics of the lunar environment need to be understood. The LRO mission will create a comprehensive atlas of the Moon's features to help NASA select landing sites, identify lunar

resources, and study the radiation environment. LCROSS, which will be launched with LRO, will search for the presence of water ice. LRO and LCROSS are planned for launch in 2009.

The Constellation Architecture Team completed and delivered the Lunar Capability Concept Review. The team carefully considered five options for lunar surface systems, including surface elements and technical issues with habitat plans, operations concepts, and nuclear and solar power systems. The review captures the performance and cargo requirements of the lunar transportation system, the Ares V launch vehicle, and the Altair lander. The review allows the teams developing the Ares V and Altair vehicles to save time by working in parallel to refine designs for the lunar outpost, including habitats, rovers, and other systems needed to live on the Moon's surface for extended periods.

Why NASA is not on track to achieve Outcome 6.1: NASA completed all reviews except the Mission Readiness Review pertinent to the launch of LRO and LCROSS. To accommodate a U.S. Air Force (USAF) request, the LRO/LCROSS launch window has been swapped with that of the USAF Orbital Test Vehicle.

Plans for achieving 6.1: The new launch date for LRO/LCROSS is scheduled for early 2009.

FY 2008 Annual Performance Goal	FY05	FY06	FY07	FY 2008
Complete the Critical Design Review (CDR), Mission Readiness Review (MRR), and Payload Engineering Review (PER) for the Lunar Reconnaissance Orbiter.	None	6SSE1 Green	7ESRT4 Green	**8AC14 Yellow**
Complete the Critical Design Review (CDR) and Mission Readiness Review (MRR) for the Lunar Crater Observation and Sensing Satellite.	None	None	None	**8AC15 Yellow**

Why NASA did not achieve APGs 8AC14 and 8AC15: LRO is now scheduled for launch in early 2009 due to the need to swap launch dates with a U.S. Air Force launch. The LRO MRR is tied to the revised launch window and, therefore, was not completed in FY 2008.

Plans for achieving 8AC14 and 8AC15: LRO is progressing well in testing and would have been ready for a late 2008 launch had the swap with the USAF launch not occurred. NASA will hold the MRR prior to launch. NASA has completed the CDR and the PER.

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.

FY05	FY06	FY07	FY 2008
11.3 Green	6.2 Green	6.2 Green	**Green**
11.4 Green			

ESMD is on track for developing key technologies to support future human exploration missions, including oxygen production from regolith, advanced rovers for surface mobility, concepts for zero boil-off cryogenic propellant storage, propulsion systems that use propellants generated from in-situ resources, and radiation hardened microelectronics to reduce mission risk.

ESMD concluded a demonstration of oxygen production from regolith using a technology called RESOLVE. Regolith is dust, soil, broken rock, and other related materials and is present on Earth, the Moon, some asteroids, and other planets. ESMD has integrated the RESOLVE technology into the SCARAB, a robotic rover developed by Carnegie Mellon equipped with a drill designed to find water and oxygen-rich soil. ESMD will demonstrate the mobile system for oxygen production in November 2008. The ability to produce oxygen from regolith is critical to establishing a lunar base because it would mean the base could produce its own oxygen from surrounding regolith, rather than relying on shipments from Earth.

At the beginning of the fiscal year, ESMD demonstrated a throttleable liquid oxygen/methane engine for use on the lunar lander. NASA's Exploration Systems Architecture Study identified this type of engine as the best choice for the lunar lander because it serves NASA's propulsion needs while being reliable and compatible with in-situ propellant production.

ESMD demonstrated the astronaut-driven 12-wheeled Chariot Lunar Truck, moving regolith to test construction methods using an attached "earthmoving" blade at the Moses Lake field test in June 2008. The test team operated the Chariot

autonomously, remotely, and under direct human control. Also at Moses Lake, ESMD demonstrated the lunar truck and ATHLETE, a multi-legged, cargo-carrying robot capable of rolling or walking over rough terrain, with a prototype lunar crane to demonstrate unloading logistics from a simulated cargo lander to the lunar truck. ESMD also has developed a prototype small, pressurized rover, and will demonstrate its utility and ability to reduce mission risk during field tests at Arizona's Black Point Lava flow in October 2008.

FY 2008 Annual Performance Goal	FY05	FY06	FY07	FY 2008
Achieve authority to proceed for a medium lander mission to be launched in the 2010-2011 timeframe that would characterize the lunar surface environment.	None	None	None	**8AC16 White**

Why NASA rated APG 8AC16 White: ESMD revised its FY 2008 budget to reprioritize content following Congressional redirection of funds in FY 2007. This reprioritization included the transfer of funding from Lunar Precursor future missions to Constellation Systems, effectively eliminating the concept of a "medium lander."

Outcome 6.3: By 2013, sufficiently develop and test technologies for nuclear power systems to enable an informed selection of systems for flight development to provide power to a lunar outpost.

FY05	FY06	FY07	FY 2008
None	None	None	**Green**

NASA successfully operated a closed Brayton cycle power conversion system in a laboratory test facility, producing over 20 kilowatts of electric power with thermal-to-electric efficiencies above 15 percent. The basic process of the Brayton cycle includes drawing surrounding air into a compression chamber. This compressed air mixes with fuel. The systems being tested as part of the Fission Surface Power Systems project are based on a closed system Brayton cycle that would use heat from a nuclear reactor to heat a gas that then expands, turning a turbine which then drives an alternator. The exhaust gas is then cooled by a heat rejection system (including radiators) and after going through a gas compressor to gain pressure, is re-circulated through the system to begin the cycle again. In this case, no exhaust gas is dumped overboard, but fully reused.

FY 2008 Annual Performance Goal	FY05	FY06	FY07	FY 2008
By 2008, demonstrate high efficiency power conversion systems in the laboratory at power levels in excess of 10 kilowatts that are relevant to future fission surface power systems.	None	None	7ESRT5 Green	**8AC17 Green**

Outcome 6.4: Implement the space communications and navigation architecture responsive to science and exploration mission requirements.

FY05	FY06	FY07	FY 2008
6.2 Green	6.4 Green	6.4 Green	**Green**

SCaN is developing a unified space communication and navigation network capable of meeting both robotic and human exploration needs. The Core Systems Engineering Team is responsible for integrating the Space, Near Earth, and Deep Space Networks, and the future Lunar and potential Mars Networks.

SCaN continues to work with the Space Operations, Exploration Systems, and Science Mission Directorates to ensure that NASA communication and navigation needs are met. As part of this effort, the program works with the commercial sector to obtain and maintain reliable technologies at competitive prices for several projects: the Communication Navigation and Networking Reconfigurable Testbed (CoNNeCT), a joint government–commercial project investigating reprogrammable (software-defined) radio technology for use during space exploration missions; the TDRS Continuation project, which will upgrade the TDRS system with two new satellites designed to serve Science and Exploration System goals; and the Near Earth Network, which provides services for orbiting satellites and the Shuttle.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Provide the Command, Control, Communication and Information (C3I) standards, validation processes and test systems designs, and demonstrate life cycle feasibility at the Ground Operations and Mission Operations Preliminary Design Reviews (PDRs).	None	None	None	**8CS11 Yellow**
Implement technology initiatives consistent with approved baseline space communications and navigations architecture.	5SFS8 Green	6SFS1 Green	7SFS2 Green	**8SFS02 Green**
Complete the Exploration Communications and Navigation System (ECANS) Preliminary Design Review (PDR).	None	None	None	**8SFS03 White**

Why NASA did not achieve APG 8CS11: Mission Operations and Ground Operations C3I specification volumes are not needed until the lunar phase.

Plans for achieving 8CS11: These C3I specification volumes will be developed in time to support the Lunar Systems Requirement Review.

Why NASA rated APG 8SFS03 White: The consolidation of space communications functions and adjustments to the Constellation schedule have resulted in this APG being no longer applicable.

Outcome 6.5: No later than 2020, demonstrate the capability to conduct an extended human expedition to the lunar surface and lay the foundation for extending human presence across the solar system.

FY05	FY06	FY07	FY 2008
None	None	None	**Green**

All lunar transportation and lunar systems planning are on track to support extended human missions to the lunar surface. From 2006 through 2008, the three Lunar Architecture Teams refined the lunar architecture and defined and evaluated Mars extensibility goals. NASA also completed the Ares V lunar launch vehicle conceptual and systems requirements designs to support the Lunar Capability Concept Review conducted in June 2008. The Ares V will be a heavy-lift vehicle capable of launching large-scale hardware into space, including a lunar landing craft and materials for extended missions on the Moon.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Develop and annually refine a lunar return architecture that has the maximum possible utility for later missions to Mars and other destinations.	None	None	None	**8CS12 Green**
Demonstrate progress towards the refinement of initial cargo launch vehicle conceptual designs to establish preliminary cargo launch vehicle system requirements.	None	None	None	**8CS13 Green**

Cross-Agency Support Programs: Education

	Green	Yellow	Red	White
3 Outcomes	3	0	0	0
6 APGs	6	0	0	0

Cross-Agency Support Programs (CASP)

Theme

Education

Theme Description

The Education Theme partners with academia, professional associations, industry, and other agencies to provide teachers and faculty with experiences that capitalize on the excitement of NASA's missions. It also offers involvement in NASA's research efforts to encourage students to pursue higher education in science, technology, engineering, and mathematics, ensuring a future supply of highly trained people.

PART Assessment Rating

Theme	Last Year Assessed	Overall Rating	Program Purpose and Design	Strategic Planning	Program Management	Program Results/ Accountability
Education	2008	Moderately Effective	100%	100%	80%	53%

NASA's Office of Education works through strategic partnerships and linkages between formal and informal education providers to strengthen the Nation's future workforce. Using the excitement of NASA's missions to inspire and capture the imagination of students, NASA programs and learning materials encourage students to pursue studies and careers in science, technology, engineering, and mathematics (STEM). NASA offers a progression of educational opportunities for students, teachers, and faculty that promote STEM literacy, help to attract and retain students in STEM disciplines, and improve awareness of NASA's Mission. Education's collaboration with the NASA Mission Directorates and Centers, other federal agencies engaged in educational activities, and various public and private partners helps to leverage the effectiveness and reach of its programs.

Benefits

NASA's landmark achievements in air and space, made possible by scientific excellence and technical innovation, have deepened humankind's understanding of the universe while yielding down-to-Earth advances in air travel, health care, electronics, computing, and more. These achievements ultimately share a single source—education. NASA's Office of Education uses NASA's unique missions and vast scientific and technical experience to inspire and motivate America's future leaders.

To achieve NASA's Strategic Goals, the Agency must ensure a pipeline of highly skilled, diverse individuals. In the near-term, NASA will meet workforce needs by additional training for current employees and recruiting employees with skills and capabilities in emerging research and technology fields into the Agency. To meet long-term workforce needs, NASA's Education programs support internships and fellowships at NASA Centers, help inspire students at all levels to pursue STEM-related careers, provide professional development opportunities to STEM teachers, and develop interesting STEM content for the classroom, the Web, and informal learning environments like museums and community-based organizations.

Risks to Achieving Education's Outcomes

In an increasingly technologically complex world, the demand and competition for tomorrow's STEM workforce is strong. Continuing and developing new partnerships with formal and informal education providers, as well as attracting and retaining STEM students in success-oriented programs, requires NASA Education to develop and maintain quality programs.

FY 2009 Performance Forecast

- The Higher Education and Minority University Research and Education Programs (MUREP) projects will continue competitive NASA Research Announcements, Cooperative Agreement Notices, and other procurement vehicles and multi-year grants awarded to institutions, faculty, and students in Agency-relevant research.
- NASA Elementary, Secondary and e-Education project will continue to implement a systemic restructuring and reallocation of budgets to realize efficiencies and cost savings based upon recommendations from the National Research Council study, and pursue partnerships that leverage technology infrastructures to deliver NASA-related content; implement a meta-tagging process for the Education Program to improve access to NASA multi-media content.
- The Informal Education Program will focus on the NASA Explorer Institutes, and establishing partnerships with institutions that can disseminate NASA content.

Outcome ED.1: Contribute to the development of the Science, Technology, Engineering and Math (STEM) workforce in disciplines needed to achieve NASA's strategic goals through a portfolio of programs.

FY05	FY06	FY07	FY 2008
13.2 Green 13.3 Green	ED-1 Green	ED-1 Green	**Green**

The Office of Education provides opportunities to help students and educators gain hands-on experience in a range of STEM-related areas through NASA internships, fellowships, and research experiences. The goal is to give students the motivation, inspiration, and experience they need to serve the Nation's current and future workforce needs. Education continued to exceed several of its award targets with more than 3,000 summer internships at NASA Centers; more than 800 study opportunities given, including 538 Space Grants, to underserved students, teachers, and faculties; and 139 grants awarded to 50 underrepresented and underserved institutions.

NASA Education continues to track trends for higher education students participating in its program. Based upon most recent data gathered, 44 percent of students who participated in NASA undergraduate programs continued to pursue advanced degrees. Of those students who completed a NASA program and were eligible to enter the workforce, 51 percent entered NASA-related careers, including working for NASA, aerospace contractors, universities and other educational institutions.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Provide 100 NASA-supported courses offered at institutions of higher education targeted at the STEM skills needed by NASA.	None	None	None	**8ED01 Green**
Serve 250 students, 150 faculty, and 40 institutions in designated EPSCoR states.	None	None	None	**8ED02 Green**
Support 125 Minority Institutions and 4,500 underserved students in STEM education programs.	None	None	None	**8ED03 Green**

Outcome ED-2: Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers and faculty.

FY05	FY06	FY07	FY 2008
None	None	None	**Green**

The Office of Education continues to attract and retain students in STEM disciplines through the use of educational opportunities for students, teachers, and faculty. Examples of programs for attracting and retaining students in STEM disciplines include:

- Over one million students designed greenhouse chambers to study plants grown from seeds that flew in space through the NASA Engineering Challenge: Lunar Plant Growth Chamber. Students also conducted classroom experiments that may help NASA find new ways to grow and sustain plants in space and on the Moon;

- INSPIRE, a program at all 10 Centers with over 200 high school interns targeted at attracting underrepresented and underserved students to STEM;
- New Digital Learning Network workshops focused on NASA's 50th anniversary; and
- Over 105,000 students participated in NASA instructional and enrichment activities through the NASA Explorer Schools project.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Maintain at FY07 levels (updated from "increase by 5%" which was planned per the FY08 budget request) the number of elementary and secondary student participants in NASA instruction and enrichment activities.	None	None	None	**8ED04 Green**
Increase by 3 percent (updated from "5 percent" which was planned per the FY08 budget request) elementary and secondary educators' use of NASA resources in their classroom instruction.	None	None	None	**8ED05 Green**

Outcome ED-3: Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission.

FY05	FY06	FY07	FY 2008
13.5 Green	None	ED-3 Green	**Green**

To promote STEM literacy and awareness of NASA's Mission, NASA's Education built upon partnerships and linkages between the NASA Museum Alliance, the Space Place Network (which includes informal education partners in every state), the Smithsonian, the NASA Visitor Centers, and Office of Education special projects.

In 2008, the NASA Museum Alliance provided programming at museums, which allowed them to share coverage of Shuttle flights STS-122, 124, 125, and 126, and coverage and exhibits for the Mars rovers, the MRO spacecraft, heliophysics, and more.

FY 2008 Annual Performance Goal	FY05	FY06	FY07	FY 2008
Provide support to 100 museums and science centers across the country to actively engage the public in NASA events and activities.	None	None	None	**8ED06 Green**

Cross-Agency Support Programs: Advanced Business Systems (ABS)

	Green	Yellow	Red	White
2 Outcomes	2	0	0	0
5 APGs	3	1	0	1

Responsible Mission Directorate Equivalent

Cross-Agency Support Programs (CASP)

Contributing Theme

Advanced Business Systems (ABS)

Theme Description

The Advanced Business Systems Theme implements Agency-wide initiatives to improve financial, procurement, asset management, and human capital performance. The initiatives integrate business decision-making with scientific and technical leadership by providing managers with timely, accurate, and useful information.

PART Assessment Rating

Theme	Last Year Assessed	Overall Rating	Program Purpose and Design	Strategic Planning	Program Management	Program Results/ Accountability
Integrated Enterprise Management	2006	Moderately Effective	80%	100%	88%	67%

NASA established the Advanced Business Systems (ABS) Theme in FY 2006 to reflect the implementation of Agency-wide business systems as a direct program. This Theme is commonly referred to by its program title, Integrated Enterprise Management Program (IEMP).

NASA established IEMP in FY 2000 to modernize and integrate NASA's business systems and processes. Since then, IEMP has implemented twelve Agency-wide business systems in support of the Agency's Strategic Plan. IEMP will continue to implement three additional Agency systems to provide Agency-wide services and quality information to decision makers prior to completing the program in FY 2009.

In the FY 2009 Budget Estimates, IEMP was transferred from the ABS Theme to the Agency Information Technology Services (AITS) Program within the Agency Management and Operations Theme, where the Office of the Chief Information Officer (OCIO) provides for management and budgeting responsibility to better align with the Agency's IT strategy. As part of this reorganization NASA officially transferred IEMP to OCIO in FY 2008.

Benefits

Within NASA's Strategic Plan, this Theme supports multiple Strategic Goals and Sub-goals, and aligns with NASA's Cross Cutting Management Strategies.

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. The program is currently implementing new systems and processes that: provide employees and management with new, secure tools for accessing personnel data, and planning and budgeting NASA's workforce; allow better safety and management of flight operations and logistics for the Agency's aircraft fleet; and standardize travel planning, travel expense reimbursement, travel payment processing, travel credit card reconciliation, and travel management reporting for NASA.

Risks to Achieving IEMP's Outcomes and Other Support Activities

One of NASA's business risks was to develop a concept of operations for Agency-wide business systems. This challenge was highlighted in a recent report produced by the Government Accountability Office, which indicated that NASA had not documented an integrated future vision for the Agency's business systems. NASA completed a business systems concept of operations during FY 2008 that includes a set of business tenets approved by the Agency's senior leadership. The concept of operations also describes the business systems' current state, desired future state and associated operational scenarios. The concept of operations document will be used to support both strategic and design decisions for future business systems enhancements.

The Agency also completed work on identifying and prioritizing business systems gaps that remain to be resolved. The work included input from the program/project management community as well as each mission support area. The gaps were prioritized by the Management/Business Systems Integration Group (M/BSIG) and work will be initiated in FY 2009 to eliminate the highest priority gaps. The M/BSIG was established to prioritize agency business systems requirements and to review requirements for any cross-functional system impacts. The M/BSIG consists of representatives from each Mission Directorate, each Center, and each Mission Support Office. The M/BSIG uses the Concept of Operations document to ensure the decisions they are making align with the vision and intent of senior Agency leaders.

IEMP also is working to mitigate additional challenges:

- Evolving Agency business requirements may require more funding and staff than is available;
- If the Agency continues to identify new high-priority business requirements that must be implemented, Centers, and Mission Support Offices may be severely impacted; and
- If customers/stakeholders do not feel that the information tools and reports provided by the Human Capital Information Environment (HCIE) are easily accessible and useable then users may reject HCIE or the project may need significant rework resulting in schedule slips and cost overruns.

FY 2009 Performance Forecast

- In FY 2009, the OCIO will place significant emphasis on consolidating networks and network management, improved security incident detection, response and management, further consolidation of desktop/laptop computer services, data center assessment for consolidation, and application portfolio management leading to consolidation. IEMP will continue to be a major focus of OCIO activities and will complete implementation of the remaining three projects. The program will finalize sunset plans and formally sunset in early FY 2010. The Competency Center will continue to focus on providing cost-effective systems management and operations and on improving service to customers across NASA. The Competency Center also will initiate work on implementing solutions to resolve the business systems gaps discussed above.

Outcome IEM-1: By 2009, implement Agency business systems that provide timely, consistent and reliable business information for management decisions.

FY 05	FY 06	FY 07	FY 2008
None	None	IEM-1 Green	**Green**

In 2008, IEMP continued to apply Agency-wide solutions allowing for timely, consistent, and reliable information. NASA also applied Agency-wide Human Capital capabilities for a Personnel Data Warehouse, a Workforce Services Portal, and standardized reports. During fall 2008, IEMP will add dashboards to further enhance NASA's Human Capital capabilities. The solution allows for a single, one-stop portal with access to all human capital information, also providing integrated reporting across various authoritative Agency systems.

The NASA Aircraft Management Information System (NAMIS) project applied the Logistics Module and Financial Interface at Dryden Flight Research Center during April 2008 and the Backshop capability of the Maintenance Module at Johnson Space Center in June 2008. The final phase of the NAMIS solution will be implemented during FY 2009, allowing the Agency to acquire for the first time a real-time and near real-time visibility into asset status, location, availability, serviceability, acquisition, cost, inventory levels, outstanding due-in's and due-out's, and operating costs. NAMIS also enables the Agency enhanced airworthiness information to improve safety and mission effectiveness.

The Integrated Asset Management, Property, Plant and Equipment (PP&E) project applied an Agency-wide NASA PP&E System in May 2008, providing accountability and visibility of PP&E assets utilized by all NASA installations, programs, and projects. The solution also provides additional capability for the financial management of capitalized personal property enhancing the Agency's ability to meet its requirements for financial reporting.

In June 2008, IEMP implemented e-Travel, one of the President's Management Agenda projects, which provides an on-line travel solution at Kennedy Space Center, in order to conduct a pilot of the system functionality. The new travel solution will be available to the remaining NASA Centers in FY 2009.

FY 2008 Annual Performance Goal	FY05	FY06	FY07	FY 2008
Implement the Property, Plant and Equipment (PP&E) module of the Integrated Asset Management Project to provide integration between functional and financial processes for accountable personal property.	None	None	None	**8IEM01 Green**

FY 2008 Annual Performance Goal	FY05	FY06	FY07	FY 2008
Implement the Human Capital Information Environment to strategically plan and manage NASA's Human Capital resulting in the elimination of redundant systems and integrating the remaining Human Capital processes and systems.	None	None	None	**8IEM02 Green**
Implement Phase 2 of the Aircraft Management Module, including the Aircraft Logistics System, Aircraft Financial System Interface to NASA's Core Financial system and the Maintenance Management module to ensure safety of ground and flight operations and improve visibility into aircraft operations processes.	None	None	None	**8IEM03 White**

Why NASA rated APG 8IEM03 White: The APG as stated incorrectly implied that Phase 2 implementation would be completed in FY 2008, while IEMP always planned to complete Phase 2 in FY 2009 (per Office of Management and Budget Exhibit 300). IEMP is on schedule to implement Phase 2 in FY 2009 as planned.

Outcome IEM-2: By 2009, increase efficiency by implementing new business systems and reengineering Agency business processes.

FY 05	FY 06	FY 07	FY 2008
None	IEM-2 Green	IEM-2 Green	**IEM-2 Green**

In 2008, IEMP continued to aid NASA in efficiency improvements with several new solutions including a Personnel Data Warehouse, a Workforce Services Portal, and the NASA PP&E System.

Compared to the baseline, the Agency improved efficiency and achieved a 79-percent reduction of quarterly corrective adjustments made to the third quarter FY 2008 financial statements. NASA also improved efficiency by reducing the time required for funds distribution from the baseline of 65 days in FY 2006 to anywhere from 24 hours to 12 days as of FY 2007 depending on the number of projects within the mission portfolio. This metric meets or exceeds the established success criteria. The Agency also reduced the year-end close process time from four and a half days to three days.

Additionally, during 2009, IEMP will complete the final phase implementation of NAMIS. The eTravel solution will also be completed with a rollout to the remaining nine NASA Centers.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Reduce the number of quarterly corrective adjustments to financial statements from the 2006 baseline of 5948 steps to the 2008 goal of 3345 steps (a 44 percent reduction).	None	None	None	**8IEM04 Green**
Increase percentage of total travel booking completed on-line, from the 2006 baseline of 1.8 percent to the 2008 goal of 50 percent.	None	None	None	**8IEM05 Yellow**

Why NASA did not achieve APG 8IEM05: The on-line booking tool, FedTraveler.com, only has been deployed to a pilot Center as of FY 2008. Agency-wide deployment and utilization of the on-line tool will not be achieved until FY 2009.

Plans for achieving 8IEM05: NASA is on track to achieve this goal. The pilot center deployment yielded a 76-percent online adoption rate. Similar results will be expected once the on-line booking tool, FedTraveler.com, is fully deployed to the Agency by FY 2009.

Cross-Agency Support Programs: Innovative Partnerships Program (IPP)

	Green	Yellow	Red	White
1 Outcome	1	0	0	0
4 APGs	4	0	0	0

Responsible Mission Directorate Equivalent

Cross-Agency Support Programs (CASP)

Contributing Theme

Innovative Partnerships Program (IPP)

Theme Description

The IPP Theme provides leveraged technology for NASA's programs through partnerships with industry, academia, other government industries, and national laboratories. The resulting technologies benefit NASA's Mission while also having strong potential transfer to commercial application and public benefit.

PART Assessment Rating

Theme	Last Year Assessed	Overall Rating	Program Purpose and Design	Strategic Planning	Program Management	Program Results/ Accountability
Innovative Partnerships Program	2008	Moderately Effective	100%	100%	89%	61%

To achieve NASA's mission in an affordable and sustainable manner, the Agency partners with industry and academia to leverage outside investments and expertise while providing an economic incentive to invest in NASA programs.

IPP supports multiple Strategic Goals and Sub-goals in the 2006 NASA Strategic Plan, and serves all four Mission Directorates with offices across NASA's 10 Centers. Mission Directorates outline their technology needs, and IPP helps satisfy those needs through research and development with efficient strategic partnerships

Benefits

IPP provides the technology solutions for NASA programs and projects through dual-use technology development and joint-partnerships. By broadening NASA's connection to emerging technologies, IPP provides an increased range of technological solutions for programs while reducing costs.

IPP provides technology transfer out of NASA (called spinoffs) for commercial or socio-economic benefit to the Nation. In addition, IPP facilitates protection of the government's rights in NASA's inventions, as mandated by legislation. Technology Transfer, Small Business Innovative Research (SBIR), and Centennial Challenges tap into sources of innovation outside NASA and leverage NASA's resources with private or other external resources to develop new technologies for NASA mission use. IPP also transfers technologies having strong potential for commercial applications yielding public benefits. All of IPP's functions primarily serve NASA's mission interests, both in the near and long terms, and with respect to a broad range of technologies and technology readiness. IPP targets and provides a broad spectrum of U.S. industrial and non-profit entities the opportunity for grass-roots direct involvement in NASA's exploration and other missions.

Risks to Achieving IPP's Outcome and Other Support Activities

Due to a constrained budget environment, IPP will reduce Technology Transfer Partnerships by more than one-third across all Centers, make fewer SBIR and Small Business Technology Transfer (STTR) awards, and reduce the Center support-contractor workforce. In addition, IPP will not fund any new Centennial Challenges. To meet this budgetary challenge, IPP is focused on continuing program management efficiencies. In its 2008 Program Assessment Rating Tool (PART) review, IPP received high ratings for overall program management. As part of the PART improvement plan, IPP will conduct regular independent evaluations of the program's effectiveness and establish and maintain a system for collecting program performance data in a way that meets verification and validation standards.

FY 2009 Performance Forecast

- Develop at least 12 technology-related significant partnerships, and complete at least 30 technology transfer agreements with the commercial and academic community through licensing, software use agreements, facility use agreements, and Space Act Agreements;
- IPP will continue ongoing prize competitions. Awarding one or more prizes to further encourage partnerships with innovative technology providers including the emerging commercial space sector.

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 05	FY 06	FY 07	FY 2008
11.7 Green	IPP-1 Green	IPP-1 Green	**Green**

IPP elements are aimed at the following objectives: adding value to programs and projects through technology development and maturation, and then infusing those technologies into the programs and projects to meet mission needs; leveraging limited NASA funding to address NASA's technology gaps through cost-shared, joint-development partnerships with industry, academia, other government agencies, and National Laboratories; helping to secure NASA's intellectual property rights to technologies developed for the Agency; transferring NASA's inventions and technologies outside of the Agency for commercial application and other public benefit; and seeking increased participation from new sources for addressing NASA's technology challenges.

In FY 2008, IPP provided a total of $3.35 million in funding for 15 technology development/technology maturation projects for projects that also received $3.4 million in Mission Directorate resources and $4.96 million in outside partner resources. IPP achieved a leveraging of almost 3:1 for IPP applied program funding.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Develop 12 (updated from "20" which was planned per the FY08 budget request) technology-related significant partnerships that create value for NASA's programs and projects. Track both quantitative dollar value and qualitative benefits to NASA (e.g., reduced volume or mass, improved safety).	None	None	7IPP1 Green	**8IPP01 Green**
Complete 30 (updated from "50" which was planned per the FY08 budget request) technology transfer agreements with the commercial and academic community through mechanisms like licenses, software use agreements, facility use agreements, and Space Act Agreements.	None	None	7IPP2 Green	**8IPP02 Green**
Fully implement an annual portfolio licensing approach that targets licensing goals of greatest value/benefit to NASA. Examples include licensing royalties and new technology products available to NASA. Royalties should be $2.4 million (updated from "$4 million" which was planned per the FY08 budget request) per year or greater.	None	None	7IPP3 Green	**8IPP03 Green**
Complete and institutionalize an enhanced Intellectual Property (IP) management process that enables stronger use of NASA's IP to support NASA's strategies. Implement such IP management together with at least one (updated from "two" which was planned per the FY08 budget request) significant NASA programs or projects.	None	None	7IPP4 Green	**8IPP04 Green**

Cross-Agency Support Programs: Strategic Capabilities Assets Program (SCAP)

	Green	Yellow	Red	White
1 Outcome	1	0	0	0
3 APGs	3	0	0	0

Responsible Mission Directorate Equivalent

Cross-Agency Support Programs (CASP)

Contributing Theme

Strategic Capabilities Assets Program (SCAP)

Theme Description

SCAP ensures that key capabilities and assets are available for future missions. It also helps NASA prioritize critical capabilities and make strategic investment decisions to replace, modify, or disposition assets.

PART Assessment Rating

Theme	Last Year Assessed	Overall Rating	Program Purpose and Design	Strategic Planning	Program Management	Program Results/ Accountability
Strategic Capabilities Assets Program	OMB has not assessed SCAP	N/A	N/A	N/A	N/A	N/A

NASA established SCAP to ensure key capabilities and assets, such as wind tunnels and test facilities at Centers, are available for future missions and to help NASA prioritize and make strategic investment decisions to replace, modify, or disposition these capabilities/assets. It is managed at the Agency level, with funding and day-to-day management responsibilities generally resident in Centers and in the Office of Infrastructure and Administration. Mission Directorates share management responsibilities with SCAP on the Aeronautics Test Program and High-End Computing Columbia Program.

Benefits

SCAP serves each NASA Mission Directorate by providing the facilities and capabilities to investigate, test, and establish new scientific and engineering theories, principles, and methods. SCAP establishes alliances between the NASA Centers with like assets; makes decisions on disposition of capabilities no longer required; identifies re-investments and re-capitalization opportunities within and among classes of assets; executes changes; and reviews these capabilities each year to ensure the requirements are still valid. SCAP ensures that NASA has the assets and capabilities needed to achieve the Agency's Mission, by strategically managing capabilities, setting uniform use policies, and reducing budget constraints by eliminating redundant and unneeded assets.

Other government agencies, industry, and academia use the SCAP facilities to enhance their resources in meeting project requirements. The resulting advanced technologies often have dual-use capabilities that improve the Nation's position in the global market place, as well as its defense capabilities.

Risks to Achieving SCAP's Outcome and Other Support Activities

Given that only selected, limited, investments are available for the recapitalization of test facilities managed by SCAP, there is a possibility that test facilities will not meet mission requirements at the desired test date.

FY 2009 Performance Forecast

- SCAP will concentrate on sustaining the infrastructure (base support or underlying structure, i.e., the basic facilities, skilled workforce equipment, services, and components required to sustain or enhance the facility itself) within asset classes and between Centers. SCAP also will institute consistency in reimbursable pricing policies, conduct quarterly program reviews for better management insight into the capabilities and provide a forum for cooperation among all the Centers within asset classes.
- SCAP in FY 2009 will initiate outreach and in-reach activities to provide user awareness of the assets and the unique set of capabilities within the SCAP portfolio and to encourage greater use of these facilities.
- SCAP is committed to developing and implementing disposition plans for assets within its purview, when no longer required by the Agency.

Outcome SC-1: Establish and maintain selected Agency level shared capabilities, across multiple classes of assets (e.g., wind tunnels, vacuum chambers, etc.), to ensure that they will continue to be available to support the missions that require them.

FY05	FY06	FY07	FY 2008
None	None	SC-1 Green	**Green**

SCAP continues to provide funding to maintain the current portfolio of capabilities and review new asset classes that may be required for future missions.

SCAP was able to recapitalize some of NASA's unique assets due to funds made available through the availability of funds at the end of the year and when SCAP dispositioned some assets and increased use of others. At the Johnson Space Center, SCAP completed upgrades of the Helium Refrigeration System and cooling water pump for the Thermal Vacuum Chambers A and B and an overhaul of the 25-ton crane just in time to test JWST. At the Plum Brook Space Power Facility at Glenn Research Center, SCAP has refurbished the hydraulic system for the five million-pound door on the facility, replaced five new turbo pumps with control and support equipment, and is procuring a new chiller and ductwork for the chamber repressurization system, all to be ready to test the Exploration Systems' Orion space capsule. In addition, SCAP has identified and prioritized, across the Agency, additional opportunities for technical capabilities re-investment and re-capitalization and is developing an execution strategy in cooperation with an independent engineering organization.

SCAP dispositioned 100 percent of the assets that were finally determined in FY 2007 as having no further NASA requirements: the 757 aircraft at Langley Research Center, the Ames Research Center 20-G Centrifuge, and all Acceleration Facilities and the Cryogenic Facility (known as the K-site) at Plum Brook. After an evaluation of costs and any projected future users, SCAP moved the 757 aircraft to Dryden Flight Research Center flyable storage, and working with the General Services Administration, SCAP has turned the plane over to the U.S. Air Force. NASA has mothballed the 20-G Centrifuge and the Cryogenic Facility. Additionally, NASA identified the Coating Chamber at the Marshal Space Flight Center as no longer required. After SCAP evaluated the cost, the program mothballed the chamber and reallocated funding to the VF5 and VF6 Thermal Vacuum Chambers at the Glenn Research Center, which as a result have been able to attract new customers and are close to being fully subscribed. Through these activities, SCAP has been able to make funds available for much needed maintenance and re-capitalization of critical technical capabilities, allowing NASA to maximize use of its assets, further reduce the risk to programs and projects, and enhance mission success.

FY 2008 Annual Performance Goals	FY05	FY06	FY07	FY 2008
Prioritize funding requirements and select classes of assets for inclusion in the Shared Capability Assets Program.	None	None	7SC1 Green	**8SC01 Green**
Identify re-investment/re-capitalization opportunities within and among classes of assets and execute the approved changes (e.g., reallocate funds, upgrade facilities, etc.).	None	None	7SC2 Green	**8SC02 Green**
Assets identified in FY 2007 that no longer have requirements for use by NASA will be dispositioned (decision made on whether to place on standby, be mothballed, be demolished, etc).	None	None	None	**8SC03 Green**

Efficiency Measures by Mission Directorate and Theme

NASA uses Efficiency Measure APGs to track performance in a number of program and project management areas, including life cycle schedule and cost and competitive award processes. NASA organizes the Efficiency Measure APGs by Theme to emphasize and encourage individual program accountability.

Total APGs	Green	Yellow	Red	White
32 APGs	18	8	2	4

FY 2008 Annual Performance Goal	FY05	FY06	FY07	FY 2008
Science Mission Directorate				
Earth Science				
Complete all development projects within 110% of the cost and schedule baseline. (This APG is repeated under Sub-goal 3B.)	5SEC14 Red	6ESS24 Red	7ESS21 Yellow	**8ES15 Yellow**
Deliver at least 90% of scheduled operating hours for all operations and research facilities. (This APG is repeated under Sub-goal 3B.)	5SEC14 Yellow	None	7ESS22 Green	**8ES16 Yellow**
Peer-review and competitively award at least 90%, by budget, of research projects.	None	None	None	**8ES17 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	7ESS24 Red	**8ES18 Green**
Heliophysics				
Complete all development projects within 110% of the cost and schedule baseline. (This APG is repeated under Sub-goal 3B.)	5SEC14 Red	6ESS24 Red	7ESS21 Yellow	**8HE07 Red**
Deliver at least 90% of scheduled operating hours for all operations and research facilities. (This APG is repeated under Sub-goal 3B.)	5SEC14 Yellow	None	7ESS22 Green	**8HE08 Green**
Peer-review and competitively award at least 90%, by budget, of research projects.	None	None	None	**8HE09 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	7ESS24 Red	**8HE10 Yellow**
Planetary Science				
Complete all development projects within 110% of the cost and schedule baseline.	5SSE15 Yellow	6SSE29 Red	7SSE10 Red	**8PS09 White**
Deliver at least 90% of scheduled operating hours for all operations and research facilities.	5SSE16 Green	6SSE30 Green	7SSE11 Green	**8PS10 Green**
Peer-review and competitively award at least 90%, by budget, of research projects.	None	None	None	**8PS11 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	6SSE32 Green	7SSE13 Red	**8PS12 Green**
Astrophysics				
Complete all development projects within 110% of the cost and schedule baseline.	5ASO13 Green	6UNIV22 White	7UNIV9 Red	**8AS09 Yellow**
Deliver at least 90% of scheduled operating hours for all operations and research facilities.	5ASO14 Yellow	6UNIV23 Green	7UNIV10 Green	**8AS10 Green**
Peer-review and competitively award at least 90%, by budget, of research projects.	None	None	None	**8AS11 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	6UNIV25 Yellow	7UNIV12 Green	**8AS12 Yellow**
Aeronautics Research Mission Directorate				

FY 2008 Annual Performance Goal	FY05	FY06	FY07	FY 2008
Aeronautics Technology				
Deliver at least 90% of scheduled operating hours for all operations and research facilities.	None	6AT12 Green	7AT8 Yellow	**8AT17 Yellow**
Increase the annual percentage of research funding awarded to Aeronautics University Partnerships.	None	6AT13 Green	7AT9 White	**8AT18 White**
Exploration Systems Mission Directorate				
Constellation Systems				
Complete all development projects within 110% of the cost and schedule baseline. (This APG is repeated under Strategic Goal 5.)	None	6CS5 Green	7CS9 White	**8CS14 White**
Reduction in ground operations cost (through 2012) of the Constellation Systems based on comparison with the Space Shuttle Program.	None	None	None	**8CS15 Green**
Exploration Systems Research and Technology				
Complete all development projects within 110% of the cost and schedule baseline.	None	6ESRT13 White	7ESRT6 White	**8AC18 Yellow**
Increase the number of technology products transferred to Constellation Systems developers for mission application.	None	None	7ESRT7 White	**8AC19 Yellow**
Human Systems Research and Technology				
Reduce time within which of NRA research grants are awarded, from proposal due date to selection, by 2.5% per year, with a goal of 135 days.	None	None	None	**8AC20 Green**
Space Operations Mission Directorate				
International Space Station				
Deliver at least 90% of scheduled operating hours for all operations and research facilities.	5ISS9 Green	7ISS6 Green	7ISS7 Green	**8ISS07 Green**
Achieve an Annual Cost Performance Index (CPI), the ratio of the value of the work accomplished versus the actual cost of the work accomplished, of greater than or equal to one.	None	None	None	**8ISS08 Green**
Space and Flight Support				
Achieve at least 98% Space Network proficiency for delivery of Space Communications services.	None	None	None	**8SFS04 Green**
Achieve less than 3% of lost operating time on the NASA Integrated Services Network (NISN) available services.	None	None	None	**8SFS05 Green**
Complete all development projects within 110% of the cost and schedule baseline.	5SFS21 Green	6SFS7 White	7SFS5 White	**8SFS06 White**
Space Shuttle				
Annually reduce the Space Shuttle sustaining engineering workforce for flight hardware and software, while maintaining safe flight.	None	None	None	**8SSP05 Green**
Deliver at least 90% of scheduled operating hours for all operations and research facilities.	5SSP5 Green	6SSP3 Green	7SSP5 Green	**8SSP06 Green**
Cross-Agency Support Programs				
Advanced Business Systems				
Complete all development projects within 110% of the cost and schedule baseline.	None	None	None	**8IEM06 Green**
Reduce the number of financial processing steps/time to perform year end closing from the 2005 baseline of 120 steps to the 2008 goal of 20 steps (an 83% reduction).	None	None	None	**8IEM07 Red**

FY 2008 Performance Improvement Plan

The following table reports all the APGs that NASA was unable to achieve fully in FY 2008 and multi-year Outcomes that NASA may not or will not achieve by the Outcome's targeted completion date. The table is organized by Mission Directorate or equivalent and Theme. The Performance Improvement Plans also are available under the Strategic Goal narratives.

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
Science				
Earth Science Theme				
8ES04 (Outcome 3A.3)	Complete Orbiting Carbon Observatory (OCO) Operational Readiness Review.	Yellow	The OCO mission Operational Readiness Review (ORR) was originally scheduled to occur in June 2008, two months before the planned August 2008 launch readiness date (LRD). Due to delays in the OCO instrument development—persistent schedule delays with the instrument manufacturer caused project management at the Jet Propulsion Laboratory to transfer a significant amount of instrument work in-house—the project was rebaselined in April 2007, extending the LRD by three months to December 2008. Consequently, the ORR slipped to September 2008. In May 2008, the launch of OCO was delayed by one month, due to launch site availability. This shifted the ORR date again, moving it to November 2008.	NASA completed the ORR in November 2008.
8ES06 (Outcome 3A.4)	Complete Global Precipitation Measurement (GPM) Mission Spacecraft Preliminary Design Review (PDR).	Yellow	NASA has rescheduled the GPM spacecraft PDR for FY 2009 to accommodate a revised funding plan.	NASA will conduct the sspacecraft PDR with the mission-level PDR, which is scheduled to occur in the first quarter of FY 2009. This change was made to accommodate a slower Goddard Space Flight Center in-house staffing ramp-up in FY 2009 without impacting the 2013 core spacecraft launch readiness date.
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.	Yellow	Performance toward this Outcome continues to be a concern due to uncertainties in climate data continuity and delays and technical issues related to the NPP mission. In particular, the NPOESS-developed Visible/Infrared Imager/Radiometer Suite (VIIRS) instrument continues to present significant development challenges, and NASA already knows that its performance will not meet all NPP Level-1 requirements and, therefore, will impact key climate research measurements of ocean color and atmospheric aerosols. VIIRS performance issues have been causing cost and schedule overruns, which impact not only the timely implementation of the systematic Earth observation missions, but the overall success of the flight program.	In addition to previous contractor management changes approved by the Tri-Agency (NOAA, Department of Defense, NASA) Executive Committee and implemented by the Integrated Program Office (IPO) on NPOESS, NASA is supplying key quality assurance personnel to support IPO technical management personnel in accelerating the completion of the VIIRS instrument. NASA also is undertaking a comprehensive analysis of science community requirements unlikely to be met by VIIRS as an initial step in devising a mitigation strategy.
8ES09 (Outcome 3A.5)	Complete the Glory mission Operational Readiness Review (ORR).	Yellow	Challenges on developing the Aerosol Polarimetry Sensor (APS) instrument delayed the ORR. NASA rebaselined the Glory project in April 2008 to accommodate the late completion of the APS instrument, establishing a June 2009 LRD.	The ORR is scheduled to occur in early 2009.

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
8ES10 (Outcome 3A.5)	Complete the Aquarius Instrument Pre-ship Review.	Yellow	The Aquarius Instrument Pre-Ship Review was originally scheduled to occur in May 2008. However, due to schedule slips by NASA's foreign partner CONAE (Comisión Nacional de Actividades Espaciales, the Argentinean space agency) on the spacecraft development, NASA rebaselined the project first in November 2006 and then again in November 2007. These rebaselines delayed the Pre-Ship Review and delayed the launch a total of 14 months.	The Instrument Pre-Ship Review is currently scheduled for mid-2009.
8ES15 (Efficiency Measure)	Complete all development projects within 110% of the cost and schedule baseline.	Yellow	While NASA's cost and schedule performance on OSTM was excellent (launch in June 2008 was on schedule and under budget), OCO is projected to exceed its budget by 16 percent due to delays in instrument development.	OCO is currently scheduled to launch in January 2009 (9.8 percent beyond the scheduled launch date), meeting the schedule portion of the APG. Launch will conclude the development phase for this mission.
8ES16 (Efficiency Measure)	Deliver at least 90% of scheduled operating hours for all operations and research facilities.	Yellow	The Aura High Resolution Dynamics Limb Sounder (HIRDLS) instrument malfunctioned on March 17, 2008, and has not provided useful data since. A solid-state recorder anomaly on December 6, 2007 affected all Aura instruments, but losses from this anomaly were minimal.	The Level One Requirements Assessment held on August 15th, 2008, rebaselined the Aura mission to three-sensor operation. This robust mission had already met its minimum success criteria and has multiple ways to achieve remaining science objectives. The project has obtained all HIRDLS data essential to mission success and will fully proceess and archive the valuable dataset, making it available to the general science community. Since August 15th, NASA has successfully delivered over 90 percent of scheduled operating hours.
Heliophysics Theme				
8HE07 (Efficiency Measure)	Complete all development projects within 110% of the cost and schedule baseline.	Red	While NASA's cost performance on IBEX was good (less than four percent growth), it was launched 14.8 percent beyond its scheduled launch date due to launch vehicle and technical delays. Of greater concern, however, is the delayed launch of SDO and the accompanying cost growth. SDO slipped from its August 2008 firm slot in the launch manifest to a wait-list slot of December 2008 due to late delivery of avionics boxes and instruments and problems with electronics parts and the high-speed data bus. Due to the high demand for Atlas V launches, no firm slots were available until January 2010. NASA anticipates that the launch date will be between 30 and 46 percent beyond the launch date established at the Confirmation Review.	SDO has requested a firm slot on the launch manifest in January 2010 while preserving the option for a launch in June 2009, in the event that the manifested payload in the June slot is not ready for launch. Launch will conclude the development phase for this mission.

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
8HE10 (Efficiency Measure)	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	Due to significant improvement demonstrated in the last two fiscal years, Heliophysics had an ambitious target to meet in FY 2008. While it failed to meet the target, the program's FY 2008 performance was in line with that of the other Science Mission Directorate programs, which is notable given that Heliophysics prepared multiple missions for launch during the year. This necessarily altered the priorities of staff members who were also responsible for grant selections.	The Science Mission Directorate is continuing its successful efforts to improve the proposal review process, but future gains in processing time will continue to be limited by a number of factors. The most significant of these is the impact of continuing resolution funding on Heliophysics's ability to make prompt selection decisions early in the fiscal year. The requirement to obligate two-year funds in the first fiscal year also limits the number of selections that can be scheduled late in the fiscal year. However, civil service and contractor staffing constraints are such that an effort to schedule most or all of the selections in the middle of the fiscal year cannot be accommodated.
Planetary Science Theme				
8PS09 (Efficiency Measure)	Complete all development projects within 110% of the cost and schedule baseline.	White	This standing uniform measure is not applicable to the Planetary Science program in fiscal year 2008, as no missions were scheduled for completion/launch.	N/A
Astrophysics Theme				
8AS09 (Efficiency Measure)	Complete all development projects within 110% of the cost and schedule baseline.	Yellow	While NASA's cost performance on Fermi met the threshold (five percent growth), NASA launched Fermi 32 percent beyond its scheduled launch date due to slips in completing the Command and Data Handling subsystem, spacecraft testing schedule conflicts with Department of Defense projects, and spacecraft contractor performance issues.	NASA successfully launched Fermi on June 11, 2008, completing the development phase for this mission.
8AS12 (Efficiency Measure)	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	Due to significant improvement demonstrated in the last two fiscal years (including a 15% decrease from FY 2006 to FY 2007), the Astrophysics Program had an ambitious target to meet in FY 2008. While it failed to meet the target, the program continues to demonstrate the best performance of the Science Mission Directorate programs.	The Science Mission Directorate is continuing its successful efforts to improve the proposal review process, but future gains in processing time will continue to be limited by a number of factors. The most significant of these is the impact of continuing resolution funding on the program's ability to make prompt selection decisions early in the fiscal year. The requirement to obligate two-year funds in the first fiscal year also limits the number of selections that can be scheduled late in the fiscal year. However, civil service and contractor staffing constraints are such that an effort to schedule most or all of the selections in the middle of the fiscal year cannot be accommodated.
Aeronautics Research				
Aeronautics Technology Theme				
8AT10 (Outcome 3E.3)	Develop a rotorcraft model, validated with data from gear noise and vibration testing, to predict reductions in gear vibration transmission.	Red	The researcher at the Glenn Research Center responsible for technical activities related to this milestone retired at the end of 2007. The highly specialized skill required for modeling of gear noise and vibration was not readily available to conduct research in-house.	The Subsonic Rotary Wing project decided to conduct this research through a NASA Research Announcement (NRA). In 2008, NASA competitively selected two universities, Ohio State University and Penn State University, through the NRA process to conduct research on gear noise and vibration modeling. The milestone will be complete in 2010.

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
8AT11 (Outcome 3E.3)	Demonstrate a composite supersonic engine fan blade containment system that is 20 percent lighter than the High Speed Research Program metallic containment system and validate through laboratory tests.	Yellow	The vendor responsible for the scaled structural sub-elements for the High Speed Research Program had planned to manufacture and test the elements by the 3rd week of September 2008. A carbon fiber supply chain backlog and a widespread power outage in southwestern Ohio delayed the manufacturing of the elements.	NASA expects to receive the elements sometime in November 2008. Once NASA receives the elements, testing will be completed in a week. Assuming a positive outcome from the test, the milestone will be completed with at the end of November 2008.
8AT14 (Outcome 3E.3)	Evaluate state-of-the-art hypersonic flight simulation tools, ablator systems, and GNC technologies using data from suborbital SOAREX flight 1.	Red	The Hypersonic Boundary Layer Transition (HyBoLT) and Sub-Orbital Aerodynamic Re-entry Experiments (SOAREX) were part of the payload on an experimental rocket, ALV-XI, developed by ATK. The rocket with its two payloads was launched from Wallops Flight facility on August 22 and was destroyed less than 30 seconds after liftoff when the rocket failed to align its trajectory on the correct flight path. The HyBoLT payload transmitted 20.5 seconds of data; however, the rocket did not reach Mach 2, which is the required speed for the experiment. It is not known whether the data will be useful but HyBoLT's sensors were working and recording data. HyBoLT would have transmitted approximately 75 seconds of data had the rocket not been destroyed. The SOAREX experiment was separated from the rocket during the incident and obtained 10 seconds of data. The usefulness of these data is unknown. SOAREX was not designed to operate until HyBoLT had separated from the rocket.	Both HyBoLT and SOAREX tests were designed to obtain relevant data under hypersonic flight conditions, which cannot be obtained in ground tests. The Hypersonics project will pursue other flight test opportunities through partnerships with other government agencies and organizations. An example is partnership with the Air Force on the Hypersonic International Flight Research Experiments (HIFIRE) program, in which NASA is a partner for three of the HIFIRE flights. These flight experiments will provide critical boundary layer transition, mode transition, and aerothermal heating data under hypersonic flight conditions, which will be used to validate models developed by NASA.
8AT16 (Outcome 3E.4)	Develop a long-term, flight operations/test infrastructure vision and funded plan working with all the appropriate stakeholders, to assure that the plan reflects the priorities of the long-term needs of the Nation.	Yellow	NASA did not achieve APG 8AT16 due to program management changes in the second quarter of FY 2008. The incoming program manager made several visits to the Dryden Flight Research Center during the second and third quarter FY 2008 to understand the issues and opportunities for NASA flight testing and this new understanding resulted in a management decision to engage the RAND corporation for support in developing a new strategic	ATP awarded a contract to the RAND corporation in the fourth quarter FY 2008 for this effort and the scheduled completion is during the second quarter FY 2009.

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
8AT17 (Efficiency Measure)	Deliver at least 90% of scheduled operating hours for all operations and research facilities.	Yellow	Several significant tests originally planned for ATP facilities in FY 2008 were either cancelled by the test customer or moved into another fiscal year. In addition, a number of unexpected breakdowns and construction project delays occurred at several facilities at Langley Research Center, resulting in the delivery of 71 percent of scheduled operating hours for ground test assets.	ATP will continue to work with Centers and portfolio managers to accurately estimate, project, and secure test activities for its test capability assets. In addition, ATP will continue to invest in test facility maintenance and upgrade projects with the goal of improving facility reliability, availability and overall attractiveness to test customers. However, due to the age and current condition of the facilities, system failures and the resulting unplanned downtime are constant risks. To mitigate this in FY 2009, ATP will develop a new program management strategy and will use this strategy to implement recommendations for its ground test facilities and related infrastructure from the comprehensive, independent facility condition assessment commissioned in FY 2008.
8AT18 (Efficiency Measure)	Increase the annual percentage of research funding awarded to Aeronautics University Partnerships.	White	This Efficiency Measure is an artifact of ARMD's plan prior to the reformulation in FY 2005. As such, it is no longer applicable to the current program.	ARMD does not have plans to implement this Efficiency Measure. NASA will remove it from future Performance Plans.
Exploration Systems				
Constellation Systems Theme				
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.	Yellow	Prior milestones need to be completed before the Orion and EVA PDRs are held.	The SDRs and PNARs gave approval for the Ares 1, Orion, Ground Operations, and Mission Operations projects to proceed toward PDR. The EVA Systems project is underway to complete its PNAR in early FY 2009. As a result of several Government Accountability Office (GAO) bid protests concerning the award of the Constellation Space Suit System (CSSS) prime contract and the subsequent termination of that contract in FY 2008, NASA is in the process of taking corrective action with this procurement and will be updating its project milestones to accommodate the delay in the award of the CSSS contract, including rescheduling its PDR and subsequent internal technical reviews.
8CS01 (Outcome 4.1)	Complete the Preliminary Design Review (PDR) for the Orion/Crew Exploration Vehicle (CEV).	Yellow	NASA did not achieve the APG due to the refinement in the deliverable schedules since the time these metrics were established. These metrics were established when the project was still in early formulation.	Since establishment of these goals, NASA refined the Orion project schedule and shifted the PDR to align with the new program milestones. The Orion project continues to perform Design Analysis Cycles that will lead to the PDR currently scheduled for FY 2009.
8CS04 (Outcome 4.1)	Complete the Critical Design Review (CDR) for the ground infrastructure/systems at the launch site.	White	The completion of the Ground Operationss CDR during this reporting period was erroneously established as an APG for FY 2008. The current project schedule is essentially unchanged and currently provides for Project CDR in October 2010. In support of this schedule, NASA completed the project SDR as scheduled in May 6, 2008, and the PDR is scheduled for November 2008.	N/A

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
8CS06 (Outcome 4.1)	Complete the Preliminary Design Review (PDR) for the Extravehicular Activity (EVA) Systems.	Yellow	NASA established these metrics when the EVA Systems project was still in early formulation. Since then, the project found it necessary to refine its schedule during the reporting period by shifting the PDR to align with new program milestones. In addition, in response to several protests filed by the Exploration Systems and Technology LLC (EST)—the unsuccessful offeror—with the GAO between contract award on June 12 and September 29, 2008, NASA notified the GAO that it determined that "corrective action" was appropriate and, as part of the corrective action, NASA terminated the original CSSS contract awarded to Oceaneering International, Inc. (OII) for the convenience of the government, The GAO then dismissed the original EST protest and all supplemental protests as "academic," given NASA's decision to take corrective action.	NASA is implementing a corrective action plan and will update its key project milestones accordingly to accommodate that plan. NASA is replanning the EVA Systems project preliminary design efforts to accommodate the delay. Although the GAO protests have been dismissed, Federal acquisition regulations still prohibit NASA from discussing details about a pending procurement matter.
8CS08 (Outcome 5.2)	Complete the Flight Demonstration 1 Readiness Review leading up to demonstration flights in FY 2009.	Yellow	In an effort to enable commercial success in this high-risk venture, NASA has negotiated the agreement timeline at the request of one of the COTS partners.	The flight Demonstration 1 Readiness Review is delayed until March 2009, and NASA expects that the long-term goals of the program will be met.
8CS11 (Outcome 6.4)	Provide the Command, Control, Communication and Information (C3I) standards, validation processes and test systems designs, and demonstrate life cycle feasibility at the Ground Operations and Mission Operations Preliminary Design Reviews (PDRs).	Yellow	Mission Operations and Ground Operations C3I specification volumes are not needed until the lunar phase.	These C3I specification volumes will be developed in time to support the Lunar Systems Requirement Review.
8CS14 (Efficiency Measure)	Complete all development projects within 110% of the cost and schedule baseline.	White	There were no Constellation Program projects in development scheduled for completion during this fiscal year.	N/A
Advanced Capabilities Theme				
8AC04 (Outcome 3C.4)	Develop and deliver the Radiation Assessment Detector (RAD) for the Mars Science Laboratory, scheduled to fly in 2009.	Yellow	The slight slip in schedule was due to the need to address technical issues with the power systems and some failing parts at a vendor. Both these issues have been addressed to NASA's satisfaction.	The RAD instrument is scheduled for delivery to NASA's Jet Propulsion Laboratory for final integration with the MSL rover on November 10, 2008. RAD will be temporarily integrated with MSL the week of September 2, 2008, to verify electrical interfaces, and then returned to Southwest Research Institute for environmental testing. NASA does not anticipate any impacts to the MSL schedule.
8AC05 (Outcome 3F.1)	Complete development of a renal stone countermeasure and validate it for use.	Yellow	NASA completed the experiment and results are on the ISS Web site, but the study has not yet been submitted for journal publication. This is due to the need for a human system risk board to occur in order to assess operational utility. This risk board meets on a regular basis to discuss human research findings with medical operations.	Project scientists will submit the results for publication in peer reviewed journals and present at national meetings after the human system risk board's assessment in the first quarter of 2009.

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
8AC08 (Outcome 3F.1)	Determine the stability of a controlled set of food/nutritional items and common medications, representative of the types and classes typically provided on space missions, after six months exposure to the space flight environment.	Yellow	The fourth kit of food/nutritional items and common medications is still in orbit. The other three have landed and have been analyzed.	The fourth kit will land in the first quarter of FY 2009 and then will be analyzed to complete the requirements of this APG.
8AC09 (Outcome 3F.2)	Deliver two prototype life support systems: the Carbon Dioxide and Moisture Removal Amine System (CAMRAS); and the Sorbent Based Air Revitalization (SBAR) System.	Yellow	The third CAMRAS unit has not yet been delivered due to issues that arose during fabrication.	The third CAMRAS unit is scheduled to be delivered in November 2008. The other two units have already been delivered.
8AC10 (Outcome 3F.3)	Deliver the Vehicle Cabin Atmosphere Monitoring (VCAM) flight hardware in preparation for launch to ISS.	Yellow	There is a high degree of uncertainty in availability of upmass (weight and volume capacity) for a February 2009 launch and a high likelihood for upmass availability for a July 2009 launch.	NASA may move the Pre-Ship Review date from September 30, 2008, to no later than December 15, 2008, and the additional time prior to shipment will be used for further characterization of VCAM performance. This characterization will improve understanding and confidence of on-orbit behavior.
Outcome 6.1	By 2008, launch a Lunar Reconnaissance Orbiter (LRO) that will provide information about potential human exploration sites.	Yellow	NASA completed all reviews except the Mission Readiness Review pertinent to the launch of LRO and LCROSS. To accommodate a U.S. Air Force (USAF) request, the LRO/LCROSS launch window has been swapped with that of the USAF Orbital Test Vehicle.	The new launch date for LRO/LCROSS is scheduled for early 2009.
8AC14 (Outcome 6.1)	Complete the Critical Design Review (CDR), Mission Readiness Review (MRR), and Pre-Environmental Review (PER) for the Lunar Reconnaissance Orbiter.	Yellow	LRO is now scheduled for launch in early 2009 due to the need to swap launch dates with a U.S. Air Force launch. The LRO MRR is tied to the revised launch window and, therefore, was not completed in FY 2008.	LRO is progressing well in testing and would have been ready for a late 2008 launch had the swap with the USAF launch not occurred. NASA will hold the MRR prior to launch. NASA has completed the CDR and the PER.
8AC15 (Outcome 6.1)	Complete the Critical Design Review (CDR) and Mission Readiness Review (MRR) for the Lunar Crater Observation and Sensing Satellite.	Yellow	LRO is now scheduled for launch in early 2009 due to the need to swap launch dates with a U.S. Air Force launch. The LRO MRR is tied to the revised launch window and, therefore, was not completed in FY 2008.	LRO is progressing well in testing and would have been ready for a late 2008 launch had the swap with the USAF launch not occurred. NASA will hold the MRR prior to launch. NASA has completed the CDR and the PER.
8AC16 (Outcome 6.2)	Achieve authority to proceed for a medium lander mission to be launched in the 2010-2011 timeframe that would characterize the lunar surface environment.	White	ESMD revised its FY 2008 budget to reprioritize content following Congressional redirection of funds in FY 2007. This reprioritization included the transfer of funding from Lunar Precursor future missions to Constellation Systems, effectively eliminating the concept of a “medium lander.”	N/A

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
8AC18 (Efficiency Measure)	Complete all development projects within 110% of the cost and schedule baseline.	Yellow	Schedule delays were due to the availability of the launch window for LRO and LCROSS (delayed launch window due to a launch swap, to give the USAF priority), contamination issues with the VCAM instrument, and a change in the heat shield material by the MSL project, which impacted the Mars Science Laboratory Entry, Descent, and Landing Instrument project.	NASA adjusted the LRO and LCROSS schedules to meet the new launch window. Technical issues are being addressed.
8AC19 (Efficiency Measure)	Increase the relative amount technology products transferred to Constellation Systems developers for mission application compared to the total budget.	Yellow	The pace of technology maturation has slowed to accommodate a constrained budget environment due to Congressional redirection.	The rate of technology transition is not expected to increase significantly in the next several years.
Space Operations				
Space Shuttle Theme				
8SSP04 (Outcome 1.2)	A 9 percent reduction (over FY 2007 values) in the annual value of Shuttle production contracts for Orbiter, External Tank, Solid Rocket Boosters, Reusable Solid Rocket Motor. Space Shuttle Main Engine and Launch & Landing, while maintaining safe flight.	Yellow	Production and hardware recycling contracts for external tank, main engine, and ground operations processing workforce needed to be maintained longer than anticipated to support the five flights per year now planned for FY 2009 and FY 2010.	The Space Shuttle Program will continue to allocate resources in a manner that ensures the safe flyout of the manifest.
Space and Flight Support Theme				
8SFS03 (Outcome 6.4)	Complete the Exploration Communications and Navigation Systems (ECANS) Preliminary Design Review (PDR).	White	The consolidation of space communications functions and adjustments to the Constellation schedule have resulted in this APG being no longer applicable.	N/A
8SFS06 (Efficiency Measure)	Complete all development projects within 110% of the cost and schedule baseline.	White	This standing uniform measure is not applicable to the SCaN program in FY 2008, as no missions were scheduled for completion/launch.	N/A
Cross Agency Support Systems				
Advanced Business Systems				
8IEM03 (Outcome IEM-1)	Implement Phase 2 of the Aircraft Management Module, including the Aircraft Logistics System, Aircraft Financial System Interface to NASA's Core Financial system and the Maintenance Management module to ensure safety of ground and flight operations and improve visibility into aircraft operations processes.	White	The APG as stated incorrectly implied that Phase 2 implementation would be completed in FY 2008, while IEMP always planned to complete Phase 2 in FY 2009 (per Office of Management and Budget Exhibit 300).. IEMP is on schedule to implement Phase 2 in FY 2009 as planned.	N/A

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
8IEM05 (Outcome IEM-2)	Increase percentage of total travel booking completed on-line, from the 2006 baseline of 1.8 percent to the 2008 goal of 50 percent.	Yellow	The on-line booking tool, FedTraveler.com, has only been deployed to a pilot Center as of FY 2008. Agency-wide deployment and utilization of the on-line tool will not be achieved until FY 2009.	NASA is on track to achieve this goal. The pilot center deployment yielded a 76-percent online adoption rate. Similar results will be expected once the on-line booking tool, FedTraveler.com, is fully deployed to the Agency by FY 2009.
8IEM07 (Efficiency Measure)	Reduce the number of financial processing steps/time to perform year-end closing from the 2005 baseline of 120 steps to the 2008 goal of 20 steps (an 83% reduction).	Red	The focus of the measure on "the number of steps or processes" is not the important factor; it is the measure of system unavailability "time" that is important. Time is mentioned in the measure description but is omitted from the metric collection. The reduction in time relates to the system "down time" or unavailability for processing during year-end processing; this is what is important to the end users as it impacts their ability to do their jobs. The baseline for the performance measure for "time" was four and a half days in FY 2006 and FY 2007 actual performance was three days.	Although IEMP reduced the number of steps from the baseline 120 to 103, in the future, the program will focus metric collection on the reduction in time.

Part 3: Financials

Message from NASA's Chief Financial Officer

November 14, 2008

NASA takes seriously its responsibility for reporting its performance to the citizens of the United States, the President and the Congress, as evidenced throughout this Performance and Accountability Report, which details NASA's programmatic and financial performance for the fiscal year ended September 30, 2008. While many challenges remain before NASA's financial management systems and processes are fully efficient and operational, during FY 2008, NASA implemented significant improvements to its systems and processes throughout the Agency to bring them in line with federal requirements and to put them on par with the performance manifested in the Agency's scientific research and exploration missions. NASA's financial management processes and systems have not yet achieved those levels of performance; however, the Agency continues to make clear and accelerating progress. The final audit reports presenting the independent auditor's opinion on the Agency's financial statements, internal controls, and legal compliance are contained in this Report. While complimenting NASA on its recent progress, as with prior years, they note NASA's continued inability to provide sufficient evidential support for the amounts presented in the financial statements and cite two internal control material weaknesses associated with Financial Systems, Analyses, and Oversight and controls over reporting of legacy Property, Plant, and Equipment and materials contracts.

In fiscal year 2008, the Agency took a new approach toward resolving weaknesses and improving the fidelity of the financial data, as well as expanding the usefulness of reported financial information to drive enhanced financial and operational performance. The Agency developed and introduced a Comprehensive Compliance Strategy and Continuous Monitoring Program to ensure that financial transactions are reported consistent with applicable accounting standards, laws and federal regulations and that financial data is accurate and reliable. Coupled with improvements in the Agency's financial and performance reporting, these improvements are already providing faster, more accurate, and more usable information to drive better decisions and resultant performance across the programs and project at NASA. Additionally, a new PP&E policy, an upgraded Integrated Asset Management system, and revisions to accounting processes are resulting in more consistent and reliable tracking and reporting of the Agency's property, plant, and equipment capital costs. These changes have been implemented with an intent to support acquisitions across all of NASA, including those related to the Constellation Program, NASA's primary program for developing the nation's next generation space exploration capabilities. Furthermore, in this past fiscal year, NASA successfully transitioned much of its transactional finance operations to the NASA Shared Services Center; and, presently, the Agency is improving its grants management processes, as well its underlying core financial system capabilities.

In FY 2008, NASA established the foundation for financial management excellence through the newly developed and implemented Comprehensive Compliance Strategy, Continuous Monitoring Program, and expanded financial performance capabilities. In FY 2009, the Agency will focus on rigorous execution using this foundation to improve effective operation of financial systems and processes and to drive even better financial performance across the Agency's operations and projects.

Sound financial management remains vital to NASA's success in achieving its mission and requires the combined efforts of the entire Agency. Along with my colleagues in the Office of the Chief Financial Officer and throughout NASA's Mission Directorates, Centers, and program and project offices, I would reaffirm the Agency's continued commitment to achieving financial management excellence.

Ronald R. Spoehel

Ronald R. Spoehel
Chief Financial Officer

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), pursuant to the requirements of 31 U.S.C. 3515 (b). While the Statements have been prepared from the books and records of NASA in accordance with generally accepted accounting principles (GAAP) and the formats prescribed by the Office of Management and Budget (OMB) in Circular No. 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 component 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 2007 are included where available. The financial statements, which describe the results of Agency operations and the Agency's financial position, are the responsibility of NASA's management. NASA's Principal Financial Statements include the following:

The **Consolidated Balance Sheet** provides information on assets, liabilities, and net position as of the end of the year, 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 for the period. Information in this statement is reported on the budgetary basis of accounting.

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.

Limitations of the Financial Statements

The principal statements have been prepared to report the financial position and results of operations of NASA pursuant to the requirements of 31 U.S.C. 3515(b). While the statements have been prepared from the books and records of NASA in accordance with generally accepted accounting principles for Federal entities and the formats prescribed by OMB, the statements are in addition to the financial reports used to monitor and control budgetary resources which are prepared from the same books and records. The statements should be read with the realization that they are for a component of the U.S. Government, a sovereign entity.

National Aeronautics and Space Administration
Consolidated Balance Sheet
As of September 30, 2008, and September 30, 2007
(In Millions of Dollars)

	Unaudited 2008	Unaudited 2007
Assets (Note 2):		
Intragovernmental:		
Fund Balance with Treasury (Note 3)	$ 9,292	$ 9,972
Investments (Note 4)	17	17
Accounts Receivable (Note 5)	74	141
Total Intragovernmental	9,383	10,130
Accounts Receivable, Net (Note 5)	2	2
Inventory and Related Property, Net (Note 6)	2,883	3,962
Property, Plant and Equipment, Net (Note 7)	21,608	20,603
Total Assets	**$ 33,876**	**$ 34,697**
Stewardship PP&E (Note 8)		
Liabilities: (Note 9)		
Intragovernmental:		
Accounts Payable	$ 102	$ 424
Other Liabilities (Note 11)	109	109
Total Intragovernmental	211	533
Accounts Payable	1,415	1,036
Federal Employee and Veteran Benefits	64	64
Environmental and Disposal Liabilities (Note 10)	943	963
Other Liabilities (Note 11)	1,615	1,389
Total Liabilities	**4,248**	**3,985**
Commitments and Contingencies (Note 12)		
Net Position:		
Unexpended Appropriations	6,389	7,470
Cumulative Results of Operations	23,239	23,242
Total Net Position	**29,628**	**30,712**
Total Liabilities and Net Position	**$ 33,876**	**$ 34,697**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Consolidated Statement of Net Cost
As of September 30, 2008, and September 30, 2007
(In Millions of Dollars)

	Unaudited 2008	Unaudited 2007
Cost by Business Line:		
Aeronautics Research		
Gross Costs	$ 783	$ 700
Less: Earned Revenue	88	106
Net Costs	695	594
Exploration Systems		
Gross Costs	$ 4,839	$ 3,217
Less: Earned Revenue	38	29
Net Costs	4,801	3,188
Science		
Gross Costs	$ 6,431	$ 5,506
Less: Earned Revenue	526	352
Net Costs	5,905	5,154
Space Operations		
Gross Costs	$ 7,378	$ 6,443
Less: Earned Revenue	391	301
Net Costs	6,987	6,142
Net Cost of Operations	**$ 18,388**	**$ 15,078**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Consolidated Statement of Changes in Net Position
As of September 30, 2008, and September 30, 2007
(In Millions of Dollars)

	Unaudited 2008	Unaudited 2007
Cumulative Results Of Operations:		
Beginning Balances	$ 23,242	$ 34,380
Adjustments:		
Changes in Accounting Principles	-	(12,703)
Beginning Balances, As Adjusted	23,242	21,677
Budgetary Financing Sources:		
Appropriations Used	18,240	16,474
Nonexchange Revenue	6	(4)
Other Financing Sources:		
Transfers In/Out Without Reimbursement	2	2
Imputed Financing	143	171
Other	(6)	-
Total Financing Sources	18,385	16,643
Net Cost of Operations	(18,388)	(15,078)
Net Change	(3)	1,565
Cumulative Results of Operations	**23,239**	**23,242**
Unexpended Appropriations:		
Beginning Balance	7,470	7,685
Budgetary Financing Sources:		
Appropriations Received	17,402	16,284
Appropriations Transferred In/Out	-	1
Other Adjustments	(243)	(26)
Appropriations Used	(18,240)	(16,474)
Total Budgetary Financing Sources	(1,081)	(215)
Unexpended Appropriations	**6,389**	**7,470**
Net Position	**$ 29,628**	**$ 30,712**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Combined Statement of Budgetary Resources
As of September 30, 2008, and September 30, 2007
(In Millions of Dollars)

	Unaudited 2008	Unaudited 2007
Budgetary Resources:		
Unobligated Balance, Brought Forward, October 1:	$ 2,594	$ 2,298
Recoveries of Prior Year Unpaid Obligations	548	460
Budgetary Authority		
Appropriation	17,403	16,285
Spending Authority from Offsetting Collections:		
Earned		
Collected	1,120	865
Change in Receivables from Federal Sources	(64)	(42)
Change in Unfilled Customer Orders		
Advance Received	(7)	(50)
Without Advance from Federal Sources	(58)	455
Subtotal	18,394	17,513
Nonexpenditure Transfers, Net, Actual	-	1
Permanently Not Available		
Cancellations of Expired and No-year Accounts	(51)	(26)
Enacted Reductions	(192)	-
Total Budgetary Resources	**$ 21,293**	**$ 20,246**
Status of Budgetary Resources:		
Obligations Incurred (Note 14):		
Direct	$19,177	$16,706
Reimbursable	1,122	946
Subtotal	20,299	17,652
Unobligated Balance:		
Apportioned	786	2,413
Unobligated Balance Not Available	208	181
Total Status of Budgetary Resources	**$ 21,293**	**$ 20,246**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Combined Statement of Budgetary Resources (Continued)
As of September 30, 2008, and September 30, 2007
(In Millions of Dollars)

	Unaudited 2008	Unaudited 2007
Change in Obligated Balance:		
Obligated Balances, Net		
Unpaid Obligations Brought Forward, October 1	$ 8,176	$ 7,671
Less: Uncollected Customer Payments from Federal Sources, Brought Forward, October 1	798	385
Total Unpaid Obligated Balances, Net	7,378	7,286
Obligations Incurred, Net	20,299	17,652
Less: Gross Outlays	18,952	16,687
Less: Recoveries of Prior Year Unpaid Obligations, Actual	548	460
Change in Uncollected Customer Payments from Federal Sources	122	(413)
	$ 8,299	$ 7,378
Obligated Balance, Net, End of Period		
Unpaid Obligations	$ 8,975	$ 8,176
Less: Uncollected Customer Payments from Federal Sources	676	798
Total, Unpaid Obligated Balance, Net, End of Period	**$ 8,299**	**$ 7,378**
Net Outlays:		
Net Outlays:		
Gross Outlays	$18,952	$ 16,687
Less: Offsetting Collections	1,113	815
Less: Distributed Offsetting Receipts	(1)	1
Net Outlays	**$ 17,840**	**$ 15,871**

The accompanying notes are an integral part of this statement.

NOTE 1. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Reporting Entity

The National Aeronautics and Space Administration (NASA) is an independent Agency 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 United States in civil space and aviation.

NASA is organized into four Business Lines which focus on the following objectives:

- Aeronautics Research: conducting research which will significantly enhance aircraft performance, environmental compatibility, and safety, and will enhance the capacity, flexibility, and safety of the future air transportation system;
- Exploration Systems: creating new capabilities, supporting technologies and foundational research for affordable, sustainable human and robotic exploration;
- 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
- Space Operations: providing critical enabling technologies for much of the rest of NASA through the Space Shuttle, the International Space Station, and flight support.

In addition, NASA has nine Business Line (Mission) Support Offices, including the Office of the Chief Financial Officer and Institutions & Management. The Agency's 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 other committees supporting NASA's focus and direction. The organizational structure is designed to streamline and position the Agency 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.

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 once carried out at each NASA center and Headquarters. These functions consisted of responsibilities in the following areas: Financial Management, Human Resources, Information Technology and Procurement.

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 No. A-136, *Financial Reporting Requirements*, revised June 3, 2008. FASAB is recognized by the American Institute of Certified Public Accountants (AICPA) as the official accounting standards-setting body for United States government entities. The statements present the financial position, net cost of operations, changes in net position, and budgetary resources of NASA, as required by the Chief Financial Officers Act of 1990 and the Government Management Reform Act of 1994.

NOTE 1. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (Continued)

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 No. 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: Exploration, Science and Aeronautics; Exploration Capabilities; and Office of Inspector General.

The Exploration, Science and Aeronautics appropriation supports the following Business Lines: Exploration Systems, Science, 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 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 and the Department of Commerce (National Oceanic and Atmospheric Administration).

Research and Development and Similar Costs

NASA makes substantial Research and Development (R&D) investments for the benefit of the United States. NASA's R&D 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 supporting the development and application of technologies critical to the economic, scientific, and technical competitiveness of the United States. Accordingly, NASA applies SFAS No. 2 to its R&D projects.

Use of Estimates

The preparation of financial statements requires management to make estimates and assumptions affecting 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 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.

NOTE 1. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (Continued)

Fund Balance with Treasury

Treasury processes cash receipts and disbursements for NASA. Fund Balance with Treasury includes general 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 (Challenger) Trust Fund established for programs to improve science and technology education.

The Endeavor Trust Fund balance is invested in short-term bills, while the Challenger Trust Fund balance is invested in short-term bills and long-term bonds. Public Law 100-404 requires a quarterly payment of $250,000 is sent to the Challenger Center from interest earned on the Challenger investments. In order to meet the requirement of providing funds to the Challenger Center, NASA invests the bi-annual interest earned in short-term bills maturing to provide $250,000 at the end of every quarter. Any interest received and not needed for the quarterly payment to the Challenger Center is invested in a bond maturing on February 15, 2019.

Public Law 102-195 requires the interest earned from the Endeavor investments be used to create the Endeavor Teacher Fellowship Program; however, there have been no funds obligated for this purpose to date.

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 referred 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 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 to be properly classified as materials and those to be properly classified as depreciable property. NASA reclassifies as property, all re-usable materials valued at $100,000 or greater with a useful life of 2 years or more, in support of large-scale assets such as the Space Shuttle and the International Space Station.

Property, Plant and Equipment

These financial statements report depreciation expense using the straight-line method using the mid-year convention when assets are placed into service for all categories of PP&E. Property with a unit cost of $100,000 or more and a useful life of 2 years or more and an alternative future use is capitalized. Capitalized costs include 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 and accountability for Government-owned property in their possession.

NOTE 1. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (Continued)

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 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 5 years or more.

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.

Liabilities Covered by Budgetary Resources

Liabilities covered by budgetary resources are liabilities 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 received.

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. 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.

Federal Employee and Veterans' Benefits

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. This liability is reported on the federal employee and veteran's benefits line on the balance sheet. The present value of these estimates at year-end was calculated by the Department of Labor using a discount rate of 4.37% in FY 2008 and 4.93% in FY 2007. This liability does include the estimated future costs for claims incurred but not reported or approved as of the end of each year.

Personnel Compensation and Benefits

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.

NOTE 1. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (Continued)

Retirement 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 7.0 percent of pay. For FERS employees, NASA makes contributions of 11.2 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 taxes.

Insurance Benefits

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 uses the applicable cost factors and imputed financing sources from the Office of Personnel and Management.

Environmental and Disposal Liabilities

The Agency records a liability for environmental and disposal clean-up costs from NASA operations which 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 to be probable, reasonably possible or remote. An annual determination is made of the status of these unfunded liabilities.

While we recognize that there may be costs associated with environmental cleanup per SFFAS No. 6, we are uncertain as to the total amount, and consequently have no basis for estimating these costs, which may be a potential departure from GAAP.

NOTE 2. NON-ENTITY ASSETS

Non-Entity Assets are those assets held by NASA, but are not available for use by NASA. For FY 2007, the amount of non-entity assets was below the displayable threshold of a million dollars.

(In Millions of Dollars)	2008	2007
Intragovernmental:		
Fund Balance with Treasury	$ (1)	$ —
Total Intragovernmental	(1)	—
Total Non-Entity Assets	**(1)**	**—**
Total Entity Assets	**33,877**	**34,697**
Total Assets	**$ 33,876**	**$ 34,697**

NOTE 3. FUND BALANCE WITH TREASURY

Fund Balance with Treasury represents the aggregate amount of the Agency's funds held on deposit with the U.S. Treasury that are available to pay liabilities. The fund types include trust, general and revolving funds 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.

General Funds primarily consists of appropriated funds for the agency.

Other Fund types include Working Capital Fund, Fines, Penalties, and Forfeitures, General Fund Proprietary Interest, Collections of Receivables from Canceled Appropriations, General Fund Proprietary Receipts, Budget Clearing and Suspense, Unavailable Check Cancellation, Undistributed Intragovernmental Payment, State and Local Taxes, Other Payroll, and US Employee Allotment Account, Savings Bonds.

(In Millions of Dollars)	2008	2007
Fund Balances:		
Trust Funds	$ 4	$ 4
General Funds	9,242	9,930
Other Fund Types	46	38
Total	**$ 9,292**	**$ 9,972**

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 available for obligation in future fiscal years. Unobligated Balances—Unavailable represent the amount remaining in appropriation accounts only 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.

(In Millions of Dollars)	2008	2007
Status of Fund Balance with Treasury:		
Unobligated Balance		
Available	$ 786	$ 2,413
Unavailable	208	181
Obligated Balance Not Yet Disbursed	8,299	7,378
Clearing and Deposit Accounts	(1)	—
Total	**$ 9,292**	**$ 9,972**

NOTE 4. INVESTMENTS

The Agency's investments consist of non-marketable par value intragovernmental securities issued by Treasury's Bureau of the Public Debt. The trust fund cash balances are invested in Treasury securities, which are purchased and redeemed at par value exclusively through Treasury's Federal Investment Branch. The effective-interest method was utilized to amortize premiums on bonds, and the straight-line method was utilized to amortize discounts on bills.

The amount of Interest Receivable was below the displayable threshold of a million dollars. In addition, the Agency did not have any adjustments resulting from the sale of securities prior to maturity or any change in value that is more than temporary.

2008

(In Millions of Dollars)	Cost	Amortization Method	Amortized (Premium) Discount	Interest Receivable	Investments, Net	Other Adjustments	Market Value Disclosure
Intragovernmental Securities:							
Non-Marketable:		Effective-interest and Straight-line					
Par Value	$ 18	0.765–6.602 %	$ (1)	$ —	$ 17	$ —	$ 17
Total	**$ 18**		**$ (1)**	**$ —**	**$ 17**	**$ —**	**$ 17**

2007

(In Millions of Dollars)	Cost	Amortization Method	Amortized (Premium) Discount	Interest Receivable	Investments, Net	Other Adjustments	Market Value Disclosure
Intragovernmental Securities:							
Non-Marketable:		Effective-interest and Straight-line					
Par Value	$ 18	4.228-9.781%	$ (1)	$ —	$ 17	$ —	$ 17
Total	**$ 18**		**$ (1)**	**$ —**	**$ 17**	**$ —**	**$ 17**

NOTE 5. ACCOUNTS RECEIVABLE, NET

The Accounts Receivable balance represents valid claims by NASA to cash or other assets of another entity. Intragovernmental Accounts Receivable represents reimbursements from other Federal entities for goods and services provided by NASA on a reimbursable basis. Accounts Receivable Due from the Public represents miscellaneous debts due to NASA from employees and/or limited reimbursements from other non-Federal entities. A periodic evaluation of public accounts receivable is performed to estimate any uncollectible amounts based on current status, financial and other relevant characteristics of debtors, and the overall relationship with the debtor. An allowance for doubtful accounts is recorded, for Accounts Receivable Due from the Public, in order to bring Accounts Receivable to its Net Realizable Value in accordance with Statements of Federal Financial Accounting Standards No. 1.

	2008		
(In Millions of Dollars)	Accounts Receivable	Allowance for Uncollectible Accounts	Net Amount Due
Intragovernmental	$ 74	$ —	$ 74
Public	2	—	2
Total	**$ 76**	**$ —**	**$ 76**

	2007		
(In Millions of Dollars)	Accounts Receivable	Allowance for Uncollectible Accounts	Net Amount Due
Intragovernmental	$ 141	$ —	$ 141
Public	2	—	2
Total	**$ 143**	**$ —**	**$ 143**

NOTE 6. INVENTORY AND RELATED PROPERTY, NET

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 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 exceeding 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. NASA held $419 million of obsolete, unserviceable Operating Materials and Supplies in FY2008, an increase of $4 million from the FY2007 balance of $415 million.

(In Millions of Dollars)	2008	2007
Operating Materials and Supplies		
Items Held for Use	$ 2,880	$ 3,959
Items Held in Reserve for Future Use	3	3
Total	**$ 2,883**	**$ 3,962**

NOTE 7. PROPERTY, PLANT, AND EQUIPMENT, NET

NASA has International Space Station bartering agreements with international entities 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, 2008, 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 Accounting Principles Board (APB) Opinion No. 29, *Accounting for Nonmonetary Transactions*, as amended by Statement of Financial Accounting Standards No. 153, *Exchanges of Nonmonetary Assets, an amendment of APB Opinion No. 29*.

NASA's FY 2007 Statement of Changes in Net Position reflects a change in its accounting policy for Property, Plant and Equipment (PP&E) to reclassify costs previously categorized as General Property, Plant and Equipment (PP&E) as Research and Development (R&D) Expenses.

NOTE 7. PROPERTY, PLANT, AND EQUIPMENT, NET (CONTINUED)

2008

(In Millions of Dollars)	Depreciation Method	Useful Life	Cost	Accumulated Depreciation	Book Value
Space Exploration PP&E					
International Space Station	Straight-line	5–20 years	$ 21,727	$ (9,411)	$ 12,316
Space Shuttle	Straight-line	5–20 years	8,700	(8,228)	472
Shuttle/Station Equipment	Straight-line	5–20 years	395	(231)	164
Other Equipment	Straight-line	5–20 years	784	(673)	111
Work-in-Process					
Assets Under Construction		N/A	1,661		1,661
Work-in-Process—Equipment		N/A	4,383	—	4,383
Total			**37,650**	**(18,543)**	**19,107**
General PP&E					
Land			123	—	123
Structures, Facilities and Leasehold Improvements	Straight-line	15–40 years	7,163	(5,530)	1,633
Institutional Equipment	Straight-line	5–20 years	244	(173)	71
Work-in-Process					
Construction in Process		N/A	577	—	577
Internal Use Software and Development	Straight-line	5 years	214	(117)	97
Total			**8,321**	**(5,820)**	**2,501**
Total Property, Plant, and Equipment			**$ 45,971**	**$ (24,363)**	**$ 21,608**

2007

(In Millions of Dollars)	Depreciation Method	Useful Life	Cost	Accumulated Depreciation	Book Value
Space Exploration PP&E					
International Space Station	Straight-line	5–20 years	$ 21,484	$ (8,107)	$ 13,377
Space Shuttle	Straight-line	5–20 years	8,222	(7,102)	1,120
Shuttle/Station Equipment	Straight-line	5–20 years	601	(523)	78
Other Equipment	Straight-line	5–20 years	1,233	(976)	257
Work-in-Process					
Work-in-Process—Equipment		N/A	43	—	43
Assets Under Construction		N/A	3,572	—	3,572
Total			**35,155**	**(16,708)**	**18,447**
General PP&E					
Land			122	—	122
Structures, Facilities and Leasehold Improvements	Straight-line	15–40 years	6,679	(5,063)	1,616
Institutional Equipment	Straight-line	5–20 years	246	(146)	100
Work-in-Process					
Construction in Process		N/A	212	—	212
Internal Use Software and Development	Straight-line	5 years	193	(87)	106
Total			**7,452**	**(5,296)**	**2,156**
Total Property, Plant, and Equipment			**$ 42,607**	**$ (22,004)**	**$ 20,603**

NOTE 8. STEWARDSHIP PP&E

Federal agencies are required to classify and report heritage assets, in accordance with the requirements of Statement of Federal Financial Accounting Standards No. 29 (SFFAS No. 29), *Heritage Assets and Stewardship Land*.

Stewardship PP&E consists of items whose physical properties resemble those of general PP&E, but their nature differs in that their values may be indeterminable or have little meaning, or that allocating the cost of such assets (depreciation) to accounting periods is meaningless. The only type of stewardship PP&E owned by NASA are heritage assets.

Heritage Assets are property, plant, and equipment which possess one or more of the following characteristics: historical or natural significance; cultural, educational, or aesthetic value; or significant architectural characteristics. NASA's heritage assets include buildings and structures designated as National Historic Landmarks and air and spacecraft and related components on display to enhance public understanding of NASA programs.

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:

	2007	Additions	Withdrawals	2008
Buildings and Structures	18	1	1	18
Air and Space Displays and Artifacts	526	6	11	521
Art and Miscellaneous Items	1,018	5	8	1,015
Total Heritage Assets	**1,562**	**12**	**20**	**1,554**

	2006	Additions	Withdrawals	2007
Buildings and Structures	32	—	14	18
Air and Space Displays and Artifacts	496	35	5	526
Art and Miscellaneous Items	1,024	3	9	1,018
Total Heritage Assets	**1,552**	**38**	**28**	**1,562**

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. Heritage assets are withdrawn when they become inactive or multi-use heritage assets.

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.

NOTE 8. STEWARDSHIP PP&E (CONTINUED)

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. For FY 2008 NASA had 50 buildings, structures, and equipment 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.

NOTE 9. LIABILITIES NOT COVERED BY BUDGETARY RESOURCES

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.

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 110-161.

(In Millions of Dollars)	2008	2007
Intragovernmental Liabilities:		
Other Liabilities		
Workers' Compensation	$ 16	$ 16
Accounts Payable for Closed Appropriations	7	7
Total Intragovernmental	23	23
Public Liabilities:		
Accounts Payable		
Accounts Payable for Closed Appropriations	71	80
Federal Employee and Veterans Benefits		
Actuarial FECA Liability	64	64
Environmental and Disposal Liabilities	943	963
Other Liabilities		
Unfunded Annual Leave	196	182
Contingent Liabilities	6	—
Total Liabilities Not Covered by Budgetary Resources	**1,303**	**1,312**
Total Liabilities Covered by Budgetary Resources	**2,945**	**2,673**
Total Liabilities	**$ 4,248**	**$ 3,985**

NOTE 10. ENVIRONMENTAL AND DISPOSAL LIABILITIES

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. 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.

NASA assesses the likelihood of required cleanup as probable, reasonably possible or remote. If the likelihood of cleanup is probable and the cost can be reasonably estimated, a liability is recorded in the financial statements. If the likelihood of cleanup is reasonably possible, the estimated cost of cleanup is disclosed in the notes to the financial statements. If the likelihood of cleanup is remote, no action is taken.

Where current 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. The estimates calculated by the parametric models may be classified as probable or reasonably possible.

In FY 2008, NASA recorded $943 million as an unfunded liability to reflect the estimated total cost of environmental cleanup. The amount recorded in FY 2007 was $963 million. The estimate could change in the future due to identification of additional contamination, inflation, deflation, or 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. Estimates change primarily due to updated 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. If other responsible parties fail to assume their share of the liability, NASA's liability will increase.

NASA's total liability may increase based on the results of the Environmental Protection Agency's risk assessment of Trichloroethylene (TCE) in drinking water. The assessment will determine whether the TCE levels in drinking water should be reduced. A mandate to reduce the TCE level would require NASA to employ different treatment systems, extend the duration of cleanup, and reopen already remediated sites.

In addition to the probable clean up costs recognized in the financial statements, there are a number of other potential remediation sites that NASA has assessed the risk that a cleanup will be needed as a reasonable possibility. These costs could be significant. However, NASA is not always able to estimate the cleanup costs. In FY 2008, remediation costs at certain sites classified as reasonably possible were estimated at $93.2 million. In FY 2007, these remediation costs ranged from $16 million to $50 million.

While we recognize there may be environmental cleanup costs associated with the disposition of property, plant and equipment, we are uncertain as to an amount, and consequently have no basis for an estimate.

NOTE 11. OTHER LIABILITIES

2008

(In Millions of Dollars)	Current	Non-Current	Total
Intragovernmental Liabilities			
Advances from Others	$ 79	$ —	$ 79
Workers' Compensation	7	9	16
Employer Contributions and Payroll Taxes	14	—	14
Liability for Deposit and Clearing Funds	(1)	—	(1)
Other Accrued Liabilities	1	—	1
Total Intragovernmental	**100**	**9**	**109**
Unfunded Annual Leave	—	196	196
Accrued Funded Payroll	90	—	90
Advances from Others	62	—	62
Employer Contributions and Payroll Taxes	22	—	22
Liability for Deposit and Clearing Funds	—	—	—
Contract Holdbacks	1	—	1
Contingent Liabilities	—	6	6
Other Accrued Liabilities	1,238	—	1,238
Total with the Public	**1,413**	**202**	**1,615**
Total Other Liabilities	**$ 1,513**	**$ 211**	**$ 1,724**

2007

(In Millions of Dollars)	Current	Non-Current	Total
Intragovernmental Liabilities			
Advances from Others	$ 86	$ —	$ 86
Workers' Compensation	7	9	16
Employer Contributions and Payroll Taxes	11	—	11
Liability for Deposit and Clearing Funds	(6)	—	(6)
Other Accrued Liabilities	2	—	2
Total Intragovernmental	**100**	**9**	**109**
Unfunded Annual Leave	—	182	182
Accrued Funded Payroll	72	—	72
Advances from Others	67	—	67
Employer Contributions and Payroll Taxes	17	—	17
Liability for Deposit and Clearing Funds	6	—	6
Contract Holdbacks	1	—	1
Contingent Liabilities	—	—	—
Other Accrued Liabilities	1,044	—	1,044
Total with the Public	**1,207**	**182**	**1,389**
Total Other Liabilities	**$ 1,307**	**$ 191**	**$ 1,498**

NOTE 12. CONTINGENT LIABILITIES

NASA is a party in various administrative proceedings, court actions (including tort suits), and claims. For cases management and legal counsel believe it is probable that the outcomes will result in a loss to the Agency, liabilities have been recorded for September 30, 2008 and September 30, 2007 in the amounts of $6 million and $0 million, respectively. There were certain cases reviewed by legal counsel where the probable future loss could not be reasonably estimated and as such no liability has been recorded in connection with these cases.

There is one case where the likelihood of loss is reasonably possible, with a range of loss estimated from $1 million to $10 million for September 30, 2008 and from $0 million to $50 million for September 30, 2007.

NOTE 13. INTRAGOVERNMENTAL COST AND EXCHANGE REVENUE

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.

(In Millions of Dollars)	2008	2007
Aeronautics Research		
Intragovernmental Costs	$ 52	$ 157
Public Cost	731	543
Total Aeronautics Research Costs	783	700
Intragovernmental Earned Revenue	62	70
Public Earned Revenue	26	36
Total Aeronautics Research Earned Revenue	88	106
Total Aeronautics Research Net Cost	**695**	**594**
Exploration Systems		
Intragovernmental Costs	220	295
Public Cost	4,619	2,922
Total Exploration Systems Costs	4,839	3,217
Intragovernmental Earned Revenue	12	18
Public Earned Revenue	26	11
Total Exploration Systems Earned Revenue	38	29
Total Exploration Systems Net Cost	**4,801**	**3,188**
Science		
Intragovernmental Costs	369	423
Public Cost	6,062	5,083
Total Science Costs	6,431	5,506
Intragovernmental Earned Revenue	494	338
Public Earned Revenue	32	14
Total Science Earned Revenue	526	352
Total Science Net Cost	**5,905**	**5,154**
Space Operations		
Intragovernmental Costs	458	549
Public Cost	6,920	5,894
Total Space Operations Costs	7,378	6,443
Intragovernmental Earned Revenue	320	261
Public Earned Revenue	71	40
Total Space Operations Earned Revenue	391	301
Total Space Operations Net Cost	**6,987**	**6,142**
Net Cost of Operations	**$ 18,388**	**$ 15,078**

NOTE 14. APPORTIONMENT CATEGORIES OF OBLIGATIONS INCURRED: DIRECT VS. REIMBURSABLE OBLIGATIONS

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.

(In Millions of Dollars)	2008	2007
Direct Obligations:		
Category A	$ 1	$ 1
Category B	19,176	16,705
Reimbursable Obligations:		
Category B	1,122	946
Total Obligations Incurred	**$ 20,299**	**$ 17,652**

NOTE 15. EXPLANATION OF DIFFERENCES BETWEEN THE STATEMENT OF BUDGETARY RESOURCES (SBR) AND THE BUDGET OF THE U.S. GOVERNMENT

The FY 2010 Budget of the United States Government (President's Budget) presenting the actual amounts for the year ended September 30, 2008 has not been published as of the issue date of these financial statements. The FY 2010 President's Budget is scheduled for publication in 2009.

NASA reconciled the amounts of the FY 2007 column on the Statement of Budgetary Resources to the actual amounts for FY 2007 in the FY 2009 President's Budget for budgetary resources, obligations incurred, distributed offsetting receipts and net outlays as presented below.

(In Millions of Dollars)	Budgetary Resources	Obligations Incurred	Distributed Offsetting Receipts	Net Outlays
Combined Statement of Budgetary Resources	**$ 20,246**	**$ 17,652**	**$ 1**	**$ 15,871**
Included on SBR, not in President's Budget				
Expired Accounts	(234)	(54)	—	—
Distributed Offsetting Receipts	—	—	(1)	—
Other	(2)	3	—	—
Budget of the United States Government	**$ 20,010**	**$ 17,601**	**$ —**	**$ 15,871**

The difference between the Statement of Budgetary Resources and the President's Budget represents expired, unobligated balances reported on the SBR but not in the Budget of the United States Government and other is primarily rounding.

NOTE 16. UNDELIVERED ORDERS AT THE END OF THE PERIOD

Undelivered Orders at the end of the period totaled $6,188 million and $5,669 million as of September 30, 2008 and September 30, 2007, respectively.

NOTE 17. RECONCILIATION OF NET COST TO BUDGET

Statement of Federal Financial Accounting Standards No. 7 (SFFAS 7), *Accounting for Revenues and Other Financing Sources and Concepts for Reconciling Budgetary and Financial Accounting* requires a reconciliation of proprietary and budgetary accounting information. Accrual-based measures used in the Statement of Net Cost differ from the obligation-based measures used in the Statement of Budgetary Resources.

The Statement of Financing is intended to provide assurance certain financial information is consistent with similar amounts found in budget reports. The Statement of Financing reconciles obligations of budget authority to the accrual-based net cost of operations. The Net Cost of Operations as presented on the Statement of Financing is determined by netting the obligations as adjusted and non-budgetary resources and making adjustments for the total resources that do not fund net cost of operations, the total costs that do not require resources, and financing sources yet to be provided. The result is Net Cost of Operations as reported on the Statement of Net Cost.

(In Millions of Dollars)	**2008**	**2007**
Resources Used to Finance Activities:		
Budgetary Resources Obligated		
Obligations Incurred	$ 20,299	$ 17,652
Less: Spending Authority from Offsetting Collections and Recoveries	1,539	1,688
Obligations Net of Offsetting Collections and Recoveries	18,760	15,964
Less: Offsetting Receipts	(1)	1
Net Obligations	18,761	15,963
Other Resources		
Transfers In/Out Without Reimbursements	2	2
Imputed Financing from Costs Absorbed by Others	143	171
Net Other Resources Used to Finance Activities	145	173
Total Resources Used to Finance Activities	**18,906**	**16,136**
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	(584)	(582)
Resources That Fund Expenses Recognized in Prior Periods	(29)	(31)
Budgetary Offsetting Collections and Receipts that Do Not Affect the Net Costs of Operations—Other	(7)	3
Resources that Finance the Acquisition of Assets	1,371	(4,493)
Other Resources or Adjustments to Net Obligated Resources That Do Not Affect Net Cost of Operations	(2)	(2)
Total Resources Used to Finance Items Not Part of the Net Cost of Operations	**749**	**(5,105)**
Total Resources Used to Finance the Net Cost of Operations	**$ 19,655**	**$ 11,031**

NOTE 17. RECONCILIATION OF NET COST TO BUDGET (CONTINUED)

(In Millions of Dollars)	2008	2007
Components of Net Cost That Will Not Require or Generate Resources in the Current Period:		
Components Requiring or Generating Resources in Future Periods		
Increases in Annual Leave Liability	$ 14	$ 3
Increases in Environmental and Disposal Liability	—	70
Other	197	1,039
Total Components of Net Cost that Will Require or Generate Resources in Future Periods	211	1,112
Components Not Requiring or Generating Resources		
Depreciation	2,405	2,875
Revaluation of Assets or Liabilities	(6)	57
Other	(3,877)	3
Total Components of Net Cost of Operations that Will Not Require or Generate Resources	(1,478)	2,935
Total Components of Net Cost of Operations that Will Not Require or Generate Resources in the Current Period	**(1,267)**	**4,047**
Net Cost of Operations	**$ 18,388**	**$ 15,078**

National Aeronautics and Space Administration
Required Supplementary Stewardship Information
(Fiscal Years 2008, 2007, and 2006 Are Unaudited)
Stewardship Investments: Research and Development

Research and Development Expenses by Business Lines

NASA's programs and activities are carried out through four Business Lines: Aeronautics Research, Exploration Systems, Science and Space Operations. Each Business Line is comprised of multiple themes and numerous programs comprise each theme. In FY 2006 NASA's former enterprise structure was mapped to the new Business Line structure and NASA reports Research and Development (R&D) expenses using the new structure. Therefore, R&D expenses are now reported on a program not Enterprise basis. This is NASA's third year reporting under this new structure.

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 are also presented.

Research and Development Expenses by Business Line by Theme by Program

(In Millions of Dollars)	2008	2007	2006
Aeronautics Research			
Aeronautics Technology			
Aviation Safety	$ 81	$ 64	$ 152
Airspace Systems	109	87	144
Fundamental Aeronautics	439	405	754
Aeronautics Test	66	38	—
Aeronautics Technology Total	695	594	1,050
Aeronautics Research Total	**$ 695**	**$ 594**	**$ 1,050**
Exploration Systems			
Constellation Systems			
Constellation Systems	$ 4,110	$ 2.385	$ 1,419
Constellation Systems Total	4,110	2,385	1,419
Exploration Systems Research & Technology			
Exploration Technology Development	267	306	—
Lunar Precursor Robotic Program	124	149	95
Prometheus Nuclear Systems & Technology	3	14	—
Nuclear Flight Systems	11	—	24
Advanced Systems and Technology	—	—	291
Advance Space Technology	38	—	3
Technology Maturation	12	—	111
Exploration Systems Research & Technology Total	455	469	524
Human Systems Research & Technology			
Life Support & Habitation	59	130	361
Human Health & Performance	90	160	136
Human Research Program	80	—	—
Human Systems Integration	7	44	174
Human Systems Research & Technology Total	236	334	671
Exploration Systems Total	**$ 4,801**	**$ 3,188**	**$ 2,614**

Research and Development Expenses by Business Line by Theme by Program (Continued)

(In Millions of Dollars)	2008	2007	2006
Science			
Planetary Science			
Discovery	$ 72	$ 129	$ 127
New Frontiers	97	107	107
Technology	1,419	941	1,277
Deep Space Mission Systems (DSMS)	229	221	187
New Millennium	3	—	—
Planetary Science Research	—	255	321
Mars Exploration	782	699	599
Planetary Science Total	2,602	2,352	2,618
Astrophysics			
Navigator	56	88	87
James Webb Space Telescope	409	324	315
Hubble Space Telescope	218	135	452
SOFIA	63	51	—
Gamma-ray Large Space Telescope (GLAST)	61	70	87
Discovery	114	110	114
Astrophysics Explorer	85	69	58
Astrophysics Research	259	226	225
Heliophysics Explorer	56	—	—
Heliophysics Research	77	—	—
International Space Science Collaboration	18	15	6
Beyond Einstein	15	12	8
Astrophysics Total	1,431	1,100	1,352
Earth–Sun System			
Earth Systematic Missions	343	201	293
Living with a Star	153	163	257
Solar Terrestrial Probes	60	47	95
Explorer	—	78	114
Earth System Science Pathfinder	122	119	104
Earth–Sun System Multi-Mission Operations	167	209	290
Earth–Sun System Division	625	718	926
Near Earth Networks	48	—	—
Planetary Science Research	278	—	—
Applied Sciences	53	60	48
Earth–Sun Technology	—	85	82
Earth–Sun System	1,849	1,680	2,209
Science Total	**$ 5,882**	**$ 5,132**	**$ 6,179**
Total Research & Development Expenses	**$ 11,378**	**$ 8,914**	**$ 9,843**

Non-Research and Development Expenses by Business Line by Theme by Program

(In Millions of Dollars)	2008	2007	2006
Science			
Astrophysics			
SOFIA	$ —	$ —	$ 58
Earth–Sun System			
Education and Outreach	23	22	40
Science Total	**$ 23**	**$ 22**	**$ 98**
Space Operations			
Space Shuttle			
Space Shuttle	$ 3,285	$ 3,351	$ 4,245
Hurricane Recovery	94	85	—
Subtotal Space Shuttle	3,379	3,436	4,245
International Space Station	1,578	1,402	1,705
Space and Flight Support (SFS)	—	—	1,743
Space Communications	209	152	—
Launch Services	1,769	1,102	—
Rocket Propulsion Testing	44	43	—
Crew Health & Safety	8	7	—
Subtotal Space and Flight Support (SFS)	2,030	1,304	1,743
Space Operations Total	**$ 6,987**	**$ 6,142**	**$ 7,693**
Total Non-Research & Development Expenses	**$ 7,010**	**$ 6,164**	**$ 7,791**
Total Expenses	**$ 18,388**	**$ 15,078**	**$ 17,634**

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: AERONAUTICS

Theme: Aeronautics Technology (AT)
Aeronautics Technology develops technologies to improve aircraft and air system safety, security and performance; reduce aircraft noise and emissions; and increase the capacity of the National Airspace System (NAS).

Program: Aviation Safety (AvSP)
The Aviation Safety Program (AvSP) develops innovative tools, concepts, methods, and technologies that will improve the intrinsic safety attributes of current and future aircraft, and that will help overcome aviation safety challenges that would otherwise constrain the full realization of the Next Generation Air Transportation System (NextGen).

Program: Airspace Systems Program (ASP)
The Airspace Systems Program conducts research to enable NextGen capabilities such as foundational research in multi-aircraft flow and airspace optimization, trajectory design and conformance, separation methods, and adaptive systems. The Program research fro the airspace and airportal domains is integrated into gate-to-gate solutions.

Program: Fundamental Aeronautics
The Fundamental Aeronautics Program (FAP) conducts research to enable the design of vehicles that fly through any atmosphere at any speed. Future aircraft must address multiple design challenges, and therefore a key focus will be the development of physics-based, multidisciplinary design, analysis, and optimization (MDAO) tools.

Program: Aeronautics Test Program
The Aeronautics Test Program (ATP) is dedicated to the mastery and intellectual stewardship of the core competencies of Aeronautics testing, both on the ground and in the air. ATP's purpose is to ensure the strategic availability of a minimum, critical suite of aeronautical test facilities which are necessary to meet the long-term needs and requirements of the nation.

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: Constellation Systems
The Constellation Systems program (which replaced the Earth Orbit Capability program) objective is to develop, demonstrate, and deploy the capabilities to transport crew and cargo for missions to the lunar surface safely return the crew to Earth.

Theme: Advanced Capabilities
The Advanced Capabilities Theme provides knowledge, technology, and innovation that will enable current and future exploration missions.

Program: Exploration Technology Development
The Exploration Technology Development Program (ETDP) develops new technologies that will enable NASA to conduct future human and robotic exploration missions, while reducing mission risk and cost. By maturing new technologies to the level of demonstration in a relevant environment early enough to support a flight system's Preliminary Design Review, NASA can significantly reduce both cost and risk.

Program: Lunar Precursor Robotic
The Lunar Precursor Robotic program supports America's return to the Moon by executing lunar robotic missions to conduct research and prepare for future human exploration. These missions will gather data important for reducing the risks to astronauts, identify resources, and map the lunar environment.

Program: Human Research
The Human Research program (HRP) investigates and mitigates the highest risks to human health and performance in support of NASA exploration missions. ESMD and Constellation Systems documents provide the mission architecture definitions, mission concepts of operations, vehicle, habitat, and space suit performance requirements, and other technical information needed to focus the HRP efforts for specific exploration missions. HRP conducts research, develops countermeasures, and undertakes technology development to inform and support compliance with NASA's health, medical, human performance, and environmental standards.

BUSINESS LINE: SCIENCE

Theme: Planetary Science
The Planetary Science Theme advances scientific knowledge of the origin and history of the solar system, including the history of life and whether it evolved beyond Earth. Equally important is finding resources, evaluating, and mitigating the risks to humans that will be encountered as we conduct an overall balanced program of science, exploration, and aeronautics consistent with the redirection of the human spaceflight program to focus on exploration.

Program: Discovery
NASA's Discovery program gives scientists the opportunity to find innovative ways to unlock the mysteries of the solar system. It provides lower-cost, highly focused planetary science investigations designed to enhance our understanding of the solar system. The Discovery program 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: 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 Planetary Science program portfolio of missions will demand advances in power and propulsion systems.

Program: Planetary Science Research
The Planetary Science 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 the program 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: Astrophysics
The Astrophysics Theme seeks to understand the cycles of matter and energy that formed, evolve, and govern the universe, and how they created the unique conditions that support life. Where are we from? Are we alone? NASA searches for answers to these questions looking far away, towards the beginning of time, to see galaxies forming, and close to home, in search of planetary systems like Earth around nearby stars.

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: SOFIA
The Stratospheric Observatory for Infrared Astronomy (SOFIA) program offers a unique world-class facility for infrared astronomy covering parts of the spectrum that cannot be covered from the ground. As a result, SOFIA will provide unique insights into scientific questions regarding energetics of luminous galaxies, the origin of stars and planetary systems, gas and grain chemistry of the interstellar medium, and the structure of the solar system.

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: Astrophysics Explorer
The Astrophysics Explorer program (formerly Explorer) 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.

Program: Astrophysics Research
The Astrophysics Research program (formerly Universe Research) 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 missions seek to explain the phenomena associated with Albert Einstein's theory of general relativity, and thereby better understand the phenomena that govern the universe. To find answers, scientists must move beyond Einstein's theory; they must employ new techniques and launch missions to observe the universe in new and advanced ways. They must test and validate these new theories and enjoin heretofore separate fields like astronomy and particle physics.

Theme: Earth Science
NASA studies this dynamic Earth system to trace effect to cause, connect variability and forcing with response, and vastly improve national capabilities to predict climate, weather, natural hazards, and conditions in the space environment.

Program: Earth Science Research
The Earth Science Research Program improves the capability to document the global distribution of a range of important environmental parameters related to the Earth's atmosphere, hydrosphere, biosphere, cryosphere, and land surface; to understand the processes that drive and connect them; and to improve our capability to predict the future evolution of the Earth system, including climate, weather, and natural hazards.

Program: Applied Sciences
The Applied Sciences Program is focused on working with Federal agencies and national organizations to extend the use of technology and data associated with NASA's constellation of Earth system observing spacecraft. These spacecraft, which routinely make measurements using dozens of research instruments, are used by a community of Earth system scientists in laboratories, universities, and research institutions throughout the country, and around the world, to model the Earth system and improve predictions, projections, and forecasts.

Program: Earth Science System Multi-Mission Operations
The Earth Science Multi-Mission Operations Program acquires, preserves, and distributes observational data to support Earth Science focus areas in conformance with national science objectives. Facilities involved in this undertaking include data-handling, data processing, and archiving systems.

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: 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 Science Technology
The Earth Science Technology Program (ESTP) provides the Earth Science Theme with new capabilities, enabling previously unforeseen or infeasible science investigations, enhancing existing measurement capabilities, and reducing the cost, risk, and development times of Earth science measurements.

Theme: Heliophysics
The Heliophysics Theme studies the science of the Sun-Solar System Connection to: (1) understand the Sun and its effects on Earth, the solar system, and the space environmental conditions that will be experienced by explorers, and (2) demonstrate technologies that can improve future operational systems.

Program: Heliophysics Research
The Heliophysics Research program undertakes scientific investigations utilizing operational spacebased and suborbital platforms (surface, balloon, aircraft, and rocket). The program also funds basic research and modeling utilizing the results of the full array of NASA's missions.

Program: Deep Space Mission Systems (DSMS)
The Deep Space Mission System (DSMS) program enables human and robotic exploration of the solar system and beyond by providing reliable, high-performance, and cost-effective telecommunications and navigation services.

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: Heliophysics Explorer
The Heliophysics Explorer program provides frequent flight opportunities for world-class astrophysics and space physics investigations, using innovative, streamlined and efficient management approaches to spacecraft development and operations. The program is composed of an on-going series of space science missions that are independent, but share a common funding and management structure. The program emphasizes missions that can be accomplished under the control of the scientific research community and seeks to control total mission life-cycle costs. It also seeks to enhance public awareness of, and appreciation for, space science and to incorporate educational and public outreach activities.

Program: Near Earth Networks
The Near Earth Networks program provides multi-mission driven space flight tracking, telemetry and command, meteorological and photo-optical services and associated activities of customer interface, network and range scheduling, cross-cutting maintenance and systems engineering, facilities, safety, and security. These services are for near-Earth spaceflight missions, including human space flight (Space Shuttle Program and Constellation), sounding rockets, and near-Earth orbital flight in support of Science missions, Space Operations, Exploration Systems, and aeronautics services for unmanned aerial vehicle, aircraft, and rockets in support of upper atmospheric research.

Program: New Millennium
The New Millennium Program (NMP) is a technology flight validation program designed to retire risk of key emerging and breakthrough technologies to enable future NASA science missions. The objectives are to capitalize on investments being made in U.S. technological capabilities and accelerate the incorporation of payoff, advanced technologies into future science missions by conducting in-space validation missions, when the technologies must be tested in space in order to be validated. NMP allows NASA to conduct technology maturation and validation in low-cost NMP projects, rather than during science mission development.

NON-R&D Programs

BUSINESS LINE: SCIENCE

Theme: Earth Science

Program: Education and Outreach
The Earth Science Education and Outreach Program seeks to make the discoveries and knowledge generated from NASA's Earth-observing satellites and scientific research (including applied science) accessible to students, teachers, and the public. It addresses workforce preparation and the education pipeline, and engages the public in better understanding NASA Earth Science research results from space.

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.

Program: Space Shuttle
In FY 2008, the Space Shuttle Program completed four ISS assembly flights, which included the launch of major research facility modules from the European Space Agency and Japan. In FY 2009, the Space Shuttle Program manifest calls for completing the SM4 servicing mission to the Hubble Space Telescope.

Program: Hurricane Recovery
The Hurricane Recovery program includes emergency supplemental costs for Hurricane Katrina response and recovery.

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.

Program: Space Communications
The Space Communications Program (SCP) links flight missions to Earth to accomplish mission objectives. NASA's backbone of communications capabilities reliably transmit data between the ground control centers and the flight missions. These capabilities keep the missions operating safely and return volumes of science and technology data that has led to innumerable discoveries about Earth, the solar system, and the universe.

Program: Launch Services
The Launch Services Program, which works closely with other government agencies and the launch industry, seeks to ensure that the most safe, reliable, on-time, cost-effective launch opportunities are available on a wide range of launch systems.

Program: Rocket Propulsion Testing
As the principal implementing authority for NASA's rocket propulsion testing, the Rocket Propulsion Test (RPT) Program reviews, approves, and provides direction on rocket propulsion test assignments, capital asset improvements, test facility modernizations and refurbishments, integration for multi-site test activities, identification and protection of core capabilities, and the advancement and development of test technologies.

Program: Crew Health & Safety

The health care of the NASA Astronaut Corps is the responsibility of space medical operations at the Johnson Space Center. A portion of the responsibilities for that care is managed within the Crew Health and Safety program (CHS). CHS enables the following: 1) healthy and productive crew during all phases of spaceflight missions; 2) implementation of a comprehensive health care program for astronauts; and 3) the prevention and mitigation of negative long-term health consequences of space flight.

National Aeronautics and Space Administration
Required Supplementary Information
Combined Schedule of Budgetary Resources
(For the Fiscal Year Ended September 30, 2008, Unaudited)

(In Millions of Dollars)	Exploration, Science, and Aeronautics	Exploration Capabilities	Office of Inspector General	Other	Total
Budgetary Resources					
Unobligated Balance, Brought Forward, October 1	$ 1,847	$ 648	$ 4	$ 95	$ 2,594
Recoveries of Prior Year Obligations	331	170	—	47	548
Budget Authority:					
Appropriation	10,606	6,763	33	1	17,403
Spending Authority from Offsetting Collections Earned					
Collected	675	366	—	79	1,120
Change in Receivable from Federal Sources	(45)	(12)	—	(7)	(64)
Change in Unfilled Orders					
Advance Received	(2)	(3)	—	(2)	(7)
Without Advance from Federal Sources	52	(114)	—	4	(58)
Subtotal	11,286	7,000	33	75	18,394
Nonexpenditure Transfers, Net:					
Actual Transfers, Budget Authority	165	(165)	—	—	—
Actual Transfers, Unobligation Balances	5	8	—	(13)	—
Permanently Not Available					
Cancellations of Expired and No-year Accounts	—	—	(1)	(50)	(51)
Enacted Reductions	(166)	(25)	—	(1)	(192)
Total Budgetary Resources	**$ 13,468**	**$ 7,636**	**$ 36**	**$ 153**	**$ 21,293**
Status of Budgetary Resources					
Obligations Incurred:					
Direct:	$ 12,091	$ 7,036	$ 33	$ 17	$ 19,177
Reimbursable:	683	355	—	84	1,122
Subtotal	12,774	7,391	33	101	20,299
Unobligated Balance:					
Apportioned	587	182	—	17	786
Unobligated Balance Not Available	107	63	3	35	208
Total Status of Budgetary Resources	**$ 13,468**	**$ 7,636**	**$ 36**	**$ 153**	**$ 21,293**
Change in Obligated Balance					
Obligated Balance, Net, October 1	$ 5,494	$ 1,725	$ 5	$ 154	$ 7,378
Obligations Incurred	12,774	7,391	33	101	20,299
Less: Gross Outlays	11,956	6,836	34	126	18,952
Less: Recoveries of Prior Year Unpaid Obligations	331	170	—	47	548
Change in Uncollected Customer Payments from Federal Sources	(7)	126	—	3	122
	$ 5,974	$ 2,236	$ 4	$ 85	$ 8,299

National Aeronautics and Space Administration
Required Supplementary Information
Combined Schedule of Budgetary Resources
(For the Fiscal Year Ended September 30, 2008, Unaudited, Continued)

(In Millions of Dollars)	Exploration, Science, and Aeronautics	Exploration Capabilities	Office of Inspector General	Other	Total
Obligated Balance, Net, End of Period					
Unpaid Obligations	$ 6,497	$ 2,374	$ 4	$ 100	$ 8,975
Less: Uncollected Customer Payments from Federal Sources	523	138	—	15	676
Total, Unpaid Obligated Balance, Net, End of Period	**$ 5,974**	**$ 2,236**	**$ 4**	**$ 85**	**$ 8,299**
Outlays					
Net Outlays:					
Gross Outlays	$ 11,956	$ 6,836	$ 34	$ 126	$ 18,952
Less: Offsetting Collections	673	363	—	77	1,113
Less: Distributed Offsetting Receipts	—	—	—	(1)	(1)
Net Outlays	**$ 11,283**	**$ 6,473**	**$ 34**	**$ 50**	**$ 17,840**

National Aeronautics and Space Administration
Required Supplementary Information
Combined Schedule of Budgetary Resources
(For the Fiscal Year Ended September 30, 2007, Unaudited)

(In Millions of Dollars)	Exploration, Science, and Aeronautics	Exploration Capabilities	Office of Inspector General	Other	Total
Budgetary Resources					
Unobligated Balance, Brought Forward, October 1	$ 1,448	$ 743	$ 4	$ 103	$ 2,298
Recoveries of Prior Year Obligations	308	109	2	41	460
Budget Authority:					
Appropriation	10,086	6,166	32	1	16,285
Spending Authority from Offsetting Collections Earned					
Collected	469	324	—	72	865
Change in Receivable from Federal Sources	11	(41)	—	(12)	(42)
Change in Unfilled Orders					
Advance Received	(17)	(9)	—	(24)	(50)
Without Advance from Federal Sources	274	159	—	22	455
Subtotal	10,823	6,599	32	59	17,513
Nonexpenditure Transfers, Net:					
Actual Transfers, Budget Authority	(1)	2	—	—	1
Permanently Not Available					
Cancellations of Expired and No-year Accounts	—	—	(1)	(25)	(26)
Total Budgetary Resources	**$ 12,578**	**$ 7,453**	**$ 37**	**$ 178**	**$ 20,246**
Status of Budgetary Resources					
Obligations Incurred:					
Direct:	$ 10,173	$ 6,462	$ 33	$ 38	$ 16,706
Reimbursable:	558	343	—	45	946
Subtotal	10,731	6,805	33	83	17,652
Unobligated Balance:					
Apportioned	1,766	612	1	34	2,413
Unobligated Balance Not Available	81	36	3	61	181
Total Status of Budgetary Resources	**$ 12,578**	**$ 7,453**	**$ 37**	**$ 178**	**$ 20,246**
Change in Obligated Balance					
Obligated Balance, Net, October 1	$ 5,112	$ 1,838	$ 5	$ 331	$ 7,286
Obligations Incurred	10,731	6,805	33	83	17,652
Less: Gross Outlays	9,756	6,691	31	209	16,687
Less: Recoveries of Prior Year Unpaid Obligations	308	109	2	41	460
Change in Uncollected Customer Payments from Federal Sources	(285)	(118)	—	(10)	(413)
	$ 5,494	$ 1,725	$ 5	$ 154	$ 7,378

National Aeronautics and Space Administration
Required Supplementary Information
Combined Schedule of Budgetary Resources
(For the Fiscal Year Ended September 30, 2007, Unaudited, Continued)

(In Millions of Dollars)	Exploration, Science, and Aeronautics	Exploration Capabilities	Office of Inspector General	Other	Total
Obligated Balance, Net, End of Period					
Unpaid Obligations	$ 6,010	$ 1,989	$ 5	$ 172	$ 8,176
Less: Uncollected Customer Payments from Federal Sources	516	264	—	18	798
Total, Unpaid Obligated Balance, Net, End of Period	**$ 5,494**	**$ 1,725**	**$ 5**	**$ 154**	**$ 7,378**
Outlays					
Net Outlays:					
Gross Outlays	$ 9,756	$ 6,691	$ 31	$ 209	$ 16,687
Less: Offsetting Collections	452	315	—	48	815
Less: Distributed Offsetting Receipts	—	—	—	1	1
Net Outlays	**$ 9,304**	**$ 6,376**	**$ 31**	**$ 160**	**$ 15,871**

National Aeronautics and Space Administration
Required Supplementary Information
(Fiscal Years 2008 and 2007 Are Unaudited)
Deferred Maintenance

NASA has deferred maintenance only on its facilities, including structures. There is no significant deferred maintenance on other physical property, such as land, equipment, 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 (FCI). Both measures are indicators of the overall condition of NASA's facility assets. The facilities condition assessment methodology involves an independent, visual assessment of nine different systems within each facility to include: structure, roof, exterior, interior finishes, HVAC, electrical, plumbing, conveyance, and program support equipment. 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.

There has been no significant change in our deferred maintenance parametric estimating method this year. The Agency-wide FCI, based on the ratings obtained during the condition assessment site visits, remains unchanged from the previous fiscal year. The FCI values for the majority of individual Centers and sites varied less than 0.5, validating the relative stability of the Centers and sites despite the continued aging and deterioration of older facilities. Evaluation of the facility conditions by building type (Real Property Classification Code/DM Category) indicates that the Agency continues to focus maintenance and repair on direct mission-related facilities. Higher condition ratings are reported for training, launch, tracking, and fuel facilities Agency-wide. Lower condition ratings occur for infrastructure, site related systems, and static test stands.

(In Millions of Dollars)	2008	2007
Deferred Maintenance Method		
Facility Condition Index (FCI)	3.6	3.6
Target Facility Condition Index	3.8	4.0
Deferred Maintenance Estimate (Active and Inactive Facilities)	$ 2,463	$ 2,320

National Aeronautics and Space Administration
Office of Inspector General
Washington, DC 20546-0001

November 17, 2008

TO: Administrator
Chief Financial Officer

FROM: Inspector General

SUBJECT: Audit of the National Aeronautics and Space Administration's Fiscal Year 2008 Financial Statements (Report No. IG-09-006)

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 contracted with the independent certified public accounting firm Ernst & Young LLP (E&Y) to audit NASA's financial statements in accordance with the Government Accountability Office (GAO) "Government Auditing Standards" and Office of Management and Budget's Bulletin No. 07-04, "Audit Requirements for Federal Financial Statements," as amended.

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, 2008 and 2007. The disclaimer resulted from continued significant weaknesses in NASA's financial management processes and systems, including issues related to internal controls for property accounting.

The E&Y "Report on Internal Control" (Enclosure 2) includes two significant deficiencies, 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. These material weaknesses have been reported for several years.

The E&Y "Report on Compliance with Laws and Regulations" (Enclosure 3) identifies certain 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 NASA management continued to identify certain transactions that are being posted incorrectly due to improper configuration or design within the Core Financial module.

NASA made progress in improving its internal controls during FY 2008. NASA developed the Comprehensive Compliance Strategy to help NASA focus on ensuring compliance with generally accepted accounting principles (GAAP) and other financial reporting requirements. NASA uses its Continuous Monitoring Program to assess and evaluate internal controls, compliance with GAAP, and evidence that balances and activity reported in its financial statements are accurate and complete. However, NASA

management and E&Y continued to identify weaknesses in Agency-wide internal controls that impair NASA's ability to report accurate financial information on a timely basis.

To address the property, plant, and equipment (PP&E) material weakness, NASA implemented new PP&E capitalization policy and procedures, effective October 1, 2007, to ensure the value of new acquisitions of property will be accurate. NASA also implemented the Integrated Asset Management (IAM)/PP&E module in May 2008 to track and value NASA's capitalized personal property. NASA's challenge will be to ensure its processes and controls are operating effectively to accurately record capitalized property in a timely manner.

NASA should prepare a comprehensive corrective action plan to address the findings detailed in the enclosed reports and to address material weaknesses identified in the Administrator's Statement of Assurance. 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 GAO.

In fulfilling our responsibilities under the Chief Financial Officers Act of 1990, we monitored the progress of the audit, reviewed E&Y's reports and related documentation, inquired of its representatives, and ensured that E&Y met contractual requirements. Our review was not intended to enable us to express, and we do not express, an opinion on NASA's financial statements; conclusions about the effectiveness of internal controls over financial reporting; or compliance with certain laws and regulations, including, but not limited to, FFMIA.

E&Y is responsible for each of the enclosed reports and the conclusions expressed therein. Our review disclosed no instances where E&Y did not comply, in all material respects, with GAO's "Government Auditing Standards."

Robert W Cobb

Robert W. Cobb

3 Enclosures

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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, 2008 and 2007, and the related consolidated statements of net cost, and changes in net position 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) 2008, NASA continued its focused efforts to resolve long-term issues identified in its financial management processes and systems. Although significant progress has been made, we continued to identify significant weaknesses in NASA's financial management processes and systems. NASA management and our work continue to identify issues related to internal control in its property accounting principally relating to assets capitalized in prior years. 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, 2008 and 2007, and the related consolidated statements of net costs, and changes in net position 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, 2008 and 2007, and the related consolidated statements of net cost, consolidated statements of changes in net position, and combined statements of budgetary resources for the fiscal years then ended.

The notes to the financial statements describe a potential departure from accounting principles generally accepted in the United States of America in NASA's FY 2008 and FY 2007 financial statements. In its preparation and analysis of its September 30, 2007 financial statements, NASA identified certain configuration and data integrity issues and errors in balances reported on its financial statements.

The information presented in the Management's Discussion and Analysis, the Required Supplementary Stewardship Information, and the Required Supplementary Information is not a required part of 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.

In accordance with *Government Auditing Standards* and OMB Bulletin No. 07-04, *Audit Requirements for Federal Financial Statements*, as amended, we have also issued our reports dated November 12, 2008, 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 OMB Bulletin No. 07-04, as amended, and should be considered in assessing the results of our work.

Ernst & Young LLP

November 12, 2008

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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 or the Agency) as of and for the year ended September 30, 2008, and have issued our report thereon dated November 12, 2008. 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, 2008, and the related consolidated statements of net costs and changes in net position 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 by obtaining an understanding of the design effectiveness of NASA's internal control, determining whether controls had been placed in operation, assessing control risk, and performing tests of NASA's controls as a basis for designing our auditing procedures for the purpose of expressing our opinion on the financial statements, which we were ultimately not able to do, but not to express an opinion on the effectiveness of NASA's internal control over financial reporting. Accordingly, we do not express an opinion on the effectiveness of NASA's 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. 07-04, *Audit Requirements for Federal Financial Statement*, as amended. 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.

Our consideration of internal control over financial reporting was for the limited purposes described in the preceding paragraphs and would not necessarily identify all deficiencies in internal control over financial reporting that might be significant deficiencies or material weaknesses. However, as discussed below, we identified certain deficiencies in internal control over financial reporting that we consider to be significant deficiencies.

A control deficiency exists when the design or operation of a control does not allow management or employees, in the normal course of performing their assigned functions, to prevent or detect misstatements on a timely basis. A significant deficiency is a control deficiency, or combination of control deficiencies, that adversely affects the entity's ability to initiate, authorize, record, process, or report financial data reliably in accordance with generally accepted accounting principles (GAAP) such that there is more than a remote likelihood that a misstatement of the entity's financial statements that is more than inconsequential will not be prevented or detected by the entity's internal control. We consider the deficiencies described below to be significant deficiencies in internal control over financial reporting.

A material weakness is a significant deficiency, or combination of significant deficiencies, that results in more than a remote likelihood that a material misstatement of the financial statements will not be prevented or detected by the entity's internal control. Our consideration of the internal control over financial reporting was for the limited purpose described above and would not necessarily identify all deficiencies in the internal control that might be significant deficiencies and, accordingly, would not necessarily disclose all significant deficiencies that are also considered to be material weaknesses. However, we consider both matters noted—Financial Systems, Analyses, and Oversight; and Enhancements Needed for Controls over Property, Plant, and Equipment (PP&E) and Materials—to be material weaknesses.

MATERIAL WEAKNESSES

Financial Systems, Analyses, and Oversight (Modified Repeat Condition)

Overview

Beginning with its September 30, 2003 financial statements, significant issues have been identified in NASA's financial management processes and systems. In the years that followed, NASA continued to focus significant efforts in identifying and resolving long-standing systemic and financial management issues. As part of these efforts, NASA reorganized its financial management structure, implemented new processes, upgraded its system, developed new guidance, and provided training to its personnel to address these issues. During our fiscal year (FY) 2008 audit, we noted that management has continued with these initiatives in improving its processes and controls. For example, NASA indicated that progress had been made in many areas, including:

- Implemented Agency-wide Financial Management Strategy – Comprehensive Compliance Strategy (CCS)—NASA implemented a CCS that focuses on ensuring compliance with GAAP and other financial reporting requirements. NASA intends the CCS to serve as a basis for implementing comprehensive proactive corrective actions as may be required and provide guiding principles for executing effective financial management functions and activities.
- Implemented Continuous Monitoring Program (CMP)—NASA implemented the CMP, effective February 2008, to support execution of the CCS and improve upon the predecessor Agency-level Periodic Monitoring Controls process. The CMP mandates over 100 standard control activities, aligned with the CCS framework, that are required to be performed monthly by Headquarters and NASA Centers, including the NASA Shared Services Center (NSSC).

- Implemented an Evaluation, Monitoring, and Testing (EMT) Program for the CMP—NASA implemented an EMT program to evaluate Center compliance with the CCS on certain control activities at NASA Centers. The EMT program's intent is to assist in highlighting areas of difficulty or confusion with the application of the CCS, and is intended to result in remediation activities at the Center or, if necessary, improvements to the CCS and the CMP themselves.
- System Enhancements—In FY 2008, NASA implemented the first phase of its Integrated Asset Management (IAM) module for the financial management system. The PP&E portion of this module (i.e., IAM/PP&E) was implemented to create processes that integrate NASA's personal property systems with the Agency's financial system.
- NASA Shared Services Center Transition—During FY 2008, NASA transitioned significant financial management operations – Accounts Payable, Accounts Receivable, and Fund Balance with Treasury reconciliation – from its Centers to NSSC. These transitions took place in four waves from February to August, 2008. The purpose of the full consolidation of these activities at the NSSC is to improve consistency, reduce redundant processes, and gain efficiencies.
- Updated Financial Management Requirements (FMR)—A new initiative was launched in the beginning of July 2008 to revise and update the 20 volumes of the FMR. With the exception of Planning, Programming, Budgeting and Execution (PPBE) and Budget Execution, NASA's FMR volumes have been updated. The PPBE and Budget Execution volumes are scheduled by NASA to be completed in the first quarter of FY 2009. The Financial Information Systems volume has been updated but the Deputy Chief Financial Officer has requested further review by the Office of the Chief Financial Officer (OCFO) Systems office prior to publication. Grant accruals have been added to the FMR and desk procedures have been developed to support consistent execution of that policy. In addition, the PP&E volume of the FMR was updated to reflect the requirements outlined in NASA Interim Directive (NID) 9250, *Identifying Capital Assets and Capturing Their Costs*. Other improvements to PP&E policies and practices include: implementation of a new capitalization policy; enhanced validation procedures for contractor-held property, and updated controls for calculating depreciation on personal property.

However, through the end of FY 2008, NASA management's review and the results of our audit procedures continued to identify significant 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 throughout FY 2008 and will require additional refinements in FY 2009.

Continuous Monitoring Program

As reported in FY 2006, NASA management developed an entity-wide structure for routine reconciliation, analyses, and oversight processes. Throughout FY 2007 and FY 2008, NASA management continued to refine its process by accelerating certain steps to support its financial statement preparation process, and issuing more detailed guidance. In February 2008, NASA implemented the CMP to support NASA's CCS and improve upon the predecessor Periodic Monitoring Controls (PMC) submissions.

The CMP is a monthly process performed at the Centers and forwarded to Headquarters that is designed to identify issues impacting the integrity of the Centers' financial management information and provide a means for communicating and tracking of the issues centrally within the Headquarters OCFO. Each control activity outlined in the CMP guidance must include a coversheet indicating preparer and reviewer sign off, and exceptions (if any) noted. Throughout FY 2008, NASA management continued to refine the CMP process by revising the procedures surrounding certain control activities and issuing more detailed guidance to the Centers to ensure consistency within NASA.

Our review of these submissions and the related support maintained at the Centers continue to identify progress at the Centers in identifying issues, including system concerns, continuing data integrity issues, and other issues requiring immediate attention by NASA management. However, our review of these submissions also continued to identify certain weaknesses in processes – both at the Centers and at Headquarters – that could impair NASA's ability to correct material errors in a timely fashion and report reliable information in its financial statements. Specific concerns are as follows:

- Inconsistency in Summaries and Supporting Documentation—During our review of the high level summaries attached to the controls' coversheets, we noted that in certain cases, although the summary indicated no exceptions, the supporting documentation identified exceptions. In addition, we noted some instances where the total exception reported on the control matrix did not agree to the control coversheet.
- Untimely Resolution of Issues—We continued to note certain issues within the Centers' submissions that had been identified for several months but had not been resolved in a timely fashion.
- Further Guidance Needed—As noted above, Headquarters OCFO refined the CMP procedures throughout FY 2008 increasing the number of control activities from 23 to 132 performed each month. As a result, during our review of the March and June CMP submissions submitted by the Centers, we noted continued confusion on how certain procedures should be performed. As a result, many procedures were either not performed or the Centers used alternate procedures to complete the steps. Headquarters personnel were not aware that the Centers were not performing specific control activities or that the Centers had implemented alternate procedures. While such alternative approaches may be appropriate, enhanced communication and coordination appear warranted.

Recommendation

As noted above, NASA's efforts in establishing a robust CMP process have continued to evolve and improve. We recommend that NASA Headquarters and Center OCFOs:

1. Continue to strengthen controls related to its entity-wide structure for account reconciliation, analyses, and oversight by providing more in-depth, on-site quality reviews of Center and Headquarters financial functions, provide further guidance and training of new policies and procedures, periodically requesting the supporting documentation to compare to the results communicated, and improve communication so that issues may be resolved in a more timely manner.
2. Continue to offer updated guidance and training to personnel to ensure specific guidelines are consistently applied and documented as to the source of data to support the CMP submissions and the financial statements, required follow-up with timetables, and documentation retention policies. Further, training should be provided to Center and Headquarters personnel to ensure a complete understanding of the financial management system and reports that are available to perform certain tasks.

Financial Statement Preparation Processes

Our review of NASA's financial statement preparation process continued to identify 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, some data issues and evolving account reconciliation, periodic analysis, and financial statement closing processes continue to provide challenges in the timely development of auditable financial statements. The following represent issues identified during the financial statement preparation process:

- Quarterly Fluctuation Analyses—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 quarterly financial statements continued to identify inconsistencies, which required further explanation.
- Coordination of Legal Contingencies—We noted that coordination and oversight of contingencies between the Centers, Office of General Counsel (OGC) and OCFO requires improvements to help ensure that periodic financial reports appropriately record or disclose legal matters and their resolution. Although the Centers forward notification of claims to NASA Headquarters annually and through the legal letter process, limited routine coordination and oversight is performed with the parties responsible for periodic financial reporting.

- Accounting For Intra-governmental Reporting—For the third quarter financial statements, NASA was unable to agree its intra-governmental balances with its trading partners, some of whom did not respond to NASA's requests for confirmation. Our review of the Treasury difference report and supporting schedules identified an absolute value of over $250 million which NASA and its trading partners had not resolved or substantiated.

Recommendation

We recommend that NASA continue to refine its financial management systems and processes to improve its financial statement preparation process. Specifically, we recommend that NASA:

1. Continue to improve its financial reporting and internal quality review procedures to reasonably assure that information presented in the interim financial statements and Performance and Accountability Report are accurate, fully supported, and completed timely and consistent with the requirements of OMB Circular A-136, *Financial Reporting Requirements*, including rigorous use of checklists and enhanced supervisory review processes. Mock runs of the complete year-end financial statement preparation process during the third quarter are suggested to ensure processes are in place and documentation is available.
2. Continue to enhance its procedures related to confirming intra-governmental balances with its trading partners so that significant differences identified through the Treasury quarterly process do not exist. NASA should be proactive when confirming transactions and balances with non-responsive trading partners. Working with OMB is necessary to resolve differences timely.
3. Continue to offer updated guidance and training to personnel to ensure specific guidelines are documented as to the source of data to support the CMP submissions and the financial statements.
4. Enhance coordination between the OCFO, the Centers, and the OGC to ensure appropriate accounting for contingencies.

Continued Efforts Needed to Resolve Data Issues

During FY 2008, NASA continued its focused efforts in resolving many long-term data integrity issues. Although much progress was seen during FY 2008, our testing and NASA management continues to identify similar issues. Specific concerns noted include the following:

- Enhanced Internal Control Needed for Non-routine Journal Entries— During FY 2008, NASA recorded a number of journal entries totaling more than several billion dollars. Many of these entries, which required entries between proprietary, budgetary, and

memorandum accounts, corrected errors or mistakes of previously posted entries. A large volume of these entries also related to on-top journal entries used to adjust the financial statements, and were recorded at the Centers, the Competency Center, and at Headquarters OCFO. During our review of these entries we noted that sufficient documentation was not always available to support the purpose, cause, and appropriateness of the entries. Specific examples are as follows:

- During our walkthrough of the financial statement process, we were informed by OCFO that only key personnel within OCFO have the ability to post entries into the Core Financial Module after the system has been closed. However, during our journal entry analysis, we noted several entries posted by users other than those key OCFO personnel. When we inquired of management about the user IDs that were posting entries into the system after period close, we were informed that OCFO authorizes certain individuals to post adjusting entries for reporting purposes after the period closes. Based upon this disclosure, we requested from OCFO a list of those individuals with the authority to post after period close, their authority level, and the controls surrounding the posting. During our testing, we were unable to obtain from management a comprehensive list of those users with this post-close ability for adjustments and their respective authorities. Management informed us that a listing of all post-close journal entries is reviewed for unusual items.
- Additionally, when we inquired about certain non-routine entries identified in NASA's financial system, Headquarters OCFO could not readily provide documentation to support the purpose and appropriateness of the entries.
- We noted that certain entries recorded through the quarterly financial statement preparation process were not fully supported by the Centers' CMP submissions. Although the Centers perform the research to identify issues surrounding the monthly control activities and report these issues to Headquarters OCFO, the support is not provided until after Headquarters OCFO has already accessed the system internally, performed system queries and posted the respective entries that should be supported by the CMP submissions. This chronology of events could lead to misstatements if the ultimate resolution of items by the Centers differs from the posited solution recorded by Headquarters OCFO.

- Delayed Grant and Contract Close-outs—As reported in the past, we noted numerous grants and contracts, that had periods of performance ending prior to FY 2008, which had not officially been closed due to on-going contract audits, limited resources available for follow-up of missing or incomplete documentation from the vendor/grantee and a significant backlog of amounts awaiting de-obligation. For grants, because of the delay of closeout within the grant system and anomalies in how grant drawdowns are distributed, activity costs of current grants were being posted as current expense against the expired grant obligation. For several years, NASA has utilized an outside contractor to resolve the large backlog. While we noted that significant progress was made in FY

2008, we continued to note a significant number of grants and contracts awaiting closeout. For example, as of June 30, 2008, we noted over 2,700 grants with outstanding undelivered orders of approximately $24 million, and over 10,000 contracts with outstanding undelivered orders of approximately $111 million that were past their period of performance and still awaiting closeout and de-obligation. Our review at September 30, 2008 identified additional progress reducing the older undelivered orders for contracts and grants. Further, we continued to note that requested supporting documentation was not available for several contracts.

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:

1. Continue to enhance internal control surrounding manual non-routine entries, including requiring a log of all manual entries and preparing documentation that is readily available to support the entry and the approval by upper management. As appropriate, obtain Center concurrence with related adjustments and file with the journal entry related support.
2. Continue to improve its process to more timely close expired grants, and contracts. Determine if accruals are necessary for potential disallowed costs and final invoices once closeout has occurred.
3. Continue to strengthen controls over contract files to ensure that accurate and complete records are maintained in accordance with record retention policies.

Processes in Estimating NASA's Environmental Liability Continue to Require Enhancement

During our review of NASA's environmental liability estimated at $943 million as of September 30, 2008, and related disclosures to the financial statements, we noted that NASA invested significant resources in a coordinated approach between the OCFO and the Environmental Management Division (EMD) to resolve our prior year finding related to the internal controls for the unfunded environmental liability (UEL) estimation process. While NASA continues to make year-to-year progress, we noted weaknesses in NASA's ability to generate an auditable estimate of its environmental cleanup costs including its UEL estimate. Specifically,

- During our FY 2008 audit we continued to note that NASA does not have a process and controls surrounding how it identifies and estimates environmental cleanup costs in accordance with Statement of Federal Financial Accounting Standards (SFFAS) No. 6, *Accounting for Property, Plant, and Equipment*.

- NASA has not completed the design and implementation of its general and application controls for its Integrated Data Evaluation & Analysis Library (IDEAL) estimating software.
- NASA's new "joint review" that was implemented as part of its enhanced internal control of the UEL estimate was being developed in the current fiscal year, and is not as yet functioning consistently to identify inconsistencies, errors or omissions in environmental estimates. For example, we noted input errors into the IDEAL program that were not identified, inconsistencies in accounting definitions, and an inability to recreate estimates based on documentation provided. However, while we noted these items, we believe this enhanced control holds considerable promise as a foundation for NASA to build upon.

Recommendation

As it relates to the estimation of environmental liabilities, we recommend that NASA:

1. Implement corrective actions (i.e., finalize workplans and implement internal control and monitoring processes) to ensure compliance with requirements within SFFAS No. 6, *Accounting for Property, Plant, and Equipment,* related to environmental cleanup and decommissioning costs.
2. Implement preventative actions (i.e., controls) to ensure federal financial accounting requirements that relate to environmental matters are identified and implemented. This entails assigning responsibility for review of the requirements for environmental matters and conducting periodic self-assessments of NASA's implementation and adherence to federal financial requirements as they relate to environmental activities.
3. Enhance and formalize the process it uses to conduct the UEL joint review by: identifying the minimum accounting and environmental parameters to be reviewed for each UEL project estimate; requiring that a representative from OCFO and EMD review the entire IDEAL estimate prior to the joint review team meeting and provide preliminary questions prior to the meeting; automating portions of the review to minimize labor involved in the review; improving coordination of OCFO and EMD to the update the review forms; providing training specifically to the combined members of the joint review team; and updating its process documentation to match the revised process.
4. Complete the development and implementation of general and application controls as they relate to IDEAL. Specifically, complete the security and service provider controls and controls necessary to demonstrate the accuracy of the output; and
5. Continue to offer updated guidance and training to center/facility personnel involved in the estimation of environmental liabilities, including the need to ensure consistent year-to-year audit trails and documentation supporting the judgments made in calculating the UEL and environmental cleanup costs. Consider the development and sharing of "leading practices" based on existing NASA documentation practices.

Financial Management Systems Not in Substantial Compliance with FFMIA

NASA's financial management systems are not substantially compliant with the Federal Financial Management Improvement Act of 1996 (FFMIA). During FY 2008, as discussed above, NASA management took action to address its noncompliance with the FFMIA, including implementing the first phase of its IAM for the financial management system, as well as continuing to resolve long-standing data issues. Although these steps corrected certain weaknesses noted during the past five years, other weaknesses continue to exist. Specific weaknesses noted include the following:

- Certain subsidiary systems, including some property systems (i.e., real property and materials systems) are not integrated with the Core Financial Module and are not complemented by sufficient manual preventative and detective controls. While NASA integrated the personal property system during FY 2008, an additional upgrade to add NASA's real property into the IAM/PP&E module is currently planned for FY 2009.
- Although significant improvement was made in prior year at identifying and cleaning up data integrity issues, and stabilizing the system, NASA's management continued to identify certain transactions that are being posted incorrectly due to improper configuration or design within the Core Financial Module. As of September 30, 2008, NASA management identified some service requests awaiting completion to address certain issues within its Core Financial Module. Additionally, during our review of the Centers' CMP submissions, we noted several instances where the Centers identified abnormal balances within the general ledger, including differences between the financial information (FI) module and the funds management (FM) module, both residing within the Core Financial Module. Finally, during our review of journal entries within the Core Financial Module, we continued to note certain data element fields were either missing information or the information was inaccurate. For example, in some cases, we noted that NASA had not included the business area, purchase order, or vendor within the system for certain entries.
- Issues related to access and segregation of duties were noted within the Integrated Enterprise Management Program (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 of these controls designed to detect errors or inappropriate processing may also not be executed in a manner which can be expected to identify errors, which are other than inconsequential. 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 merit continued management focus.

- NASA was unable to meet certain requirements to ensure compliance with federal accounting standards, as discussed in various sections within this report.

NASA has indicated in its assurance statement that it believes its systems are not substantially compliant with the requirements of the FFMIA. NASA believes that planned activities for FY 2009 will address many of the remaining issues.

Recommendation

We recommend that NASA:

1. Continue to devise short-term and long-term resolutions to systematic and integration issues that complicate use of the IEMP.
2. Continue to resolve issues, as discussed throughout this report, which impair NASA's ability to meet the requirements of the FFMIA.
3. Continue to resolve issues related to access and segregation of duties surrounding its financial management systems. Additionally, we recommend that NASA continue to ensure that its compensating controls surrounding its integration of systems and segregation of duties issues are operating effectively to prevent, or detect and correct errors. NASA should monitor that its internal control activities, including periodic reconciliations and analysis, are performed to ensure that further data issues do not lead to difficulties in processing transactions and preparing accurate reports in the months and possibly the years to come.

Enhancements Needed for Controls over Legacy PP&E and Materials Contracts (Modified Repeat Condition)

Consistent with prior-year audit reports, our review of PP&E identified serious weaknesses in internal control for legacy assets which prevent material misstatements from being detected and corrected in a timely manner. Certain legacy issues noted in prior-year audit reports continue to challenge the Agency, particularly in relation to the International Space Station (ISS) and Space Shuttles. While significant progress has been made for new property acquisitions, legacy issues will continue to impair NASA's ability to report financial information related to PP&E.

The current year PP&E capitalization policy changes under NASA Interim Directive 9250 (NID 9250), effective the beginning of the fiscal year, and a new integrated asset management system for personal property (Integrated Asset Management (IAM)/PP&E module within IEMP) implemented late in the third quarter of FY 2008, hold promise in addressing new acquisitions of property. Internal control matters related to legacy capital assets that remain on its balance sheet for contracts originally executed in prior years will continue to impact financial reporting. To some extent, the passage of time and ultimate decommissioning of certain assets (particularly the

ISS and Space Shuttles) may serve to reduce the impact of such legacy assets on financial reporting. The weaknesses we noted during FY 2008, most of which are consistent with last year's audit report, fundamentally flow from "pre-NID 9250" arrangements (principally ISS and Space Shuttle contracts executed prior to the implementation of NID 9250) whereby NASA did not determine at the point of budget formulation, obligation recognition, contract development, accounts payable recognition, or disbursement the amounts of property it expects to buy, has contracted for, or has purchased. Rather, for these projects NASA, throughout 2008, waited until the entire transaction cycle was complete to obtain disbursement data for capitalization or, relied on contractors to do so.

NASA also continues to be heavily dependent on activities at its contractors to recognize assets created at its contractors and the contractors' reporting of property transaction via the Contractor Held Asset Tracking System (CHATS), which is not fully integrated with NASA Core Financial Module. We also note that NASA's Real Property Inventory (NRPI) and NASA Supply Management System also are not integrated with NASA's Core Financial Module. Furthermore, we also noted that NASA continues to utilize excel spreadsheets for cost capitalization related to the ISS and Space Shuttle and for depreciation on real property. Such spreadsheets are prone to input and formulaic errors. Lastly, we also continued to note certain transactions related to capital improvements, disposals, mothballed and stand-by assets, not being accounted for appropriately under the authoritative accounting literature or not consistently with NASA's accounting policy in its March 2008 FMR. The process to correct such items validates the effectiveness of some of the financial management review processes which NASA has been developing, but also highlight the need to develop consistent controls regarding capitalization approaches, with appropriately vetted position papers and notification for pending areas of review to ensure that no significant year-end adjustments are needed.

As previously noted, NASA made progress related to the PP&E issues. Highlights of those improvements from NASA management's perspective include:

- Implemented New Capitalization Policy—NASA implemented the capitalization policy developed in the prior fiscal year through NID 9250 for new acquisitions of capitalized PP&E on non-Space Shuttle or ISS programs on contracts with effective dates beginning October 1, 2007. This policy should allow NASA to capture, record, and report acquisitions of new property throughout the entire transaction lifecycle. For assets tracked under the new policy, associated Alternative Future Use (AFU) questionnaires will be validated.
- Established Enhanced Validation Procedures for Contractor-Held Property—With the implementation of the new capitalization policy, NASA enhanced its validation procedures for contractor-held property. This process will entail the Agency performing reconciliations between costs recorded in the financial system through the new policy and those reported by contractors in CHATS.

- Implemented the IAM/PP&E Module in May 2008—This module integrates asset records with related financial records for certain property classifications. IAM/PP&E should provide a linkage between personal property equipment master records and the financial asset master record. NASA anticipates that additional property classifications (e.g., real property) will be incorporated into the IAM/PP&E module in the future.
- Improved Controls for Calculating Depreciation on Personal Property—With the implementation of IAM/PP&E, NASA calculates and posts depreciation for personal property in the Agency's financial system. Previously, depreciation for personal property was calculated outside of the system on Excel spreadsheet. NASA believes this enhancement will reduce the possibility of manual or formulaic spreadsheet errors.
- Updated NASA PP&E Policies—The PP&E volume of the FMR was updated in September 2008 to reflect the requirements outlined in NID 9250. A NASA Policy Directive (NPD) has been written to replace the interim directive 9250. The NPD is currently being distributed for comments with impacted organizations. NASA Procedural Requirements have also been drafted to provide implementation guidance for the NPD.
- Conducted Annual Property Training—NASA conducted the Annual Center Property Training with Centers. The training topics included: asset capitalization policy; AFU questionnaire; out-grants and inactive property; the CMP; IAM; real property; and the NRPI system.

NASA efforts to improve its accountability of property this fiscal year, particularly with the implementation of the NID 9250 and IAM/PP&E module, should aid the Agency towards its remediation of some of the internal control issues noted in prior years. However, we noted inconsistencies in the application of the NID 9250 during this first year of implementation, such as the lack of required contract language suggested under the policy to provide a direct linkage of the costs incurred via the NASA Form (NF) 533 costs reports or invoice documentation to the costs capitalized as property. We also noted the new policy required Headquarters OCFO to approve the AFU questionnaires, Project Formulation Authorization Documents, and the Project Acquisition Plans during the front end of the project's lifecycle; however, management acknowledged that this process was not undertaken during the fiscal year but rather they reviewed these documents on an "after the fact" basis. We continue to believe that the involvement of Headquarters OCFO on the front end of a project lifecycle's process is one of the pinnacles in establishing this new policy.

Additional processes to annotate reports of contractor-held property transactions provided monthly by contractors via CHATS to designate items are capitalized consistent with the accounting treatment concluded on in the AFU questionnaires appears warranted. This issue arose as we found that NASA initially capitalized through contractor held work in process inventory approximately $1.3 billion in Crew Exploration Vehicle (CEV) fabrication costs; however, the alternative future use analysis provided for the related Orion project was categorized as research and development, and it is our understanding that such amounts were

removed from capitalization in preparing the financial statement. Further analysis appears appropriate to ensure the completeness and accuracy of contractor-held property transactions and consistency with the accounting treatment. We also noted that the impact of NASA's "Enhanced Validation Procedures for Contractor-Held Property" noted above for post-NID 9250 contracts have not yet been fully seen as management acknowledged that no such post-NID 9250 contracts have been established to require such a reconciliation during the current fiscal year.

Recommendation

We recommend that NASA:

1. Develop an action plan to resolve valuation issues where possible for legacy assets and/or conclude for some such assets that costs related to pursuit of further valuation information exceeds the potential benefits.
2. Develop more robust detect and monitoring controls beyond the high-level monthly validation procedures performed by Headquarters OCFO on the monthly real property-related schedules prepared by Center personnel and to compensate for the lack of the NRPI system being integrated with the Core Financial Module to ensure timely detection and correction of errors, adherence to accounting policies and procedures, as well as the completeness of real property-related balances and transactions. Management needs to layer in detect and monitoring controls on top of its routine processing and recordation of real property-related transactions and also extend these control requirements to the facilities department.
3. Develop more comprehensive controls over critical accounting processes at Headquarters OCFO that require the use of excel spreadsheets, specifically related to the accounting for the ISS, as well as depreciation on real property.
4. Continue to monitor and refine the implementation of its new PP&E capitalization policy and the IAM/PP&E module to ensure their effectiveness in capturing, recording and reporting acquisitions of new property throughout the entire transaction life cycle. Also continue to monitor and refine the implementation of the revised contractor cost reporting requirements to ensure its effectiveness in capturing and reconciling all costs for capitalized property from the NF 533 reports to the monthly CHATS and annual NF 1018 property reports as well as its consistency with the accounting treatment determined in the AFU questionnaires for all contracts. Furthermore, any revisions to policies should require that Headquarters OCFO be involved in the front-end of the project's lifecycle in determining whether a project or any subcomponent item has an alternative future use and should be capitalized as property. Also, Headquarters OCFO needs to involve the procurement and scientific community as a part of the post-implementation process. Periodic reporting of NASA's progress on this matter to key stakeholders is recommended.

OTHER MATTERS

Summary of FY 2007 Material Weaknesses

Issue Area	Summary Control Issue	FY 2008 Status
Material Weaknesses		
Financial Systems, Analyses, and Oversight	Internal control related to routine reconciliation, analyses, and oversight processes must be strengthened. Processes to prepare financial statements need improvement. Processes in estimating NASA's Environmental Liabilities require enhancements. Financial management systems not in substantial compliance with FFMIA. Efforts needed to resolve data integrity concerns. Certain weaknesses noted relating to general and application controls.	Improvements noted. Modified repeat condition.
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 work in process need improvement; Headquarters oversight needs improvement.	Improvements noted. Modified repeat condition.

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This report is intended solely for the information and use of the management and the OIG of NASA, OMB, GAO and Congress and is not intended to be and should not be used by anyone other than these specified parties.

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November 12, 2008

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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, 2008, and have issued our report thereon dated November 12, 2008. 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, 2008, and the related consolidated statements of net cost and changes in net position 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. 07-04, *Audit Requirements for Federal Financial Statements*, as amended, 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 no instances of 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 07-04, as amended.

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 federal system and federal accounting standard requirements:

- The NASA accounting system does not conform to certain federal requirements. Certain subsidiary systems, including some property systems, are not integrated with the Core Financial Module and, as discussed in our Report on Internal Control, are not complemented by sufficient manual preventative and detective controls. While NASA integrated aspects of the personal property system during fiscal year (FY) 2008, an additional upgrade to add NASA's real property into the Integrated Asset Management Module is currently planned for FY 2009.

- Although significant improvement was made in prior years, NASA's management continued to identify certain transactions that are being posted incorrectly due to improper configuration or design within the Core Financial Module. As of September 30, 2008, NASA management identified some service requests awaiting completion to address certain issues within its Core Financial Module. Additionally, during our review of the Centers' Continuous Monitoring Program submissions, we noted several instances where the Centers identified abnormal balances within the general ledger, including differences between the financial information (FI) module and the funds management (FM) module, both residing within the Core Financial Module. Finally, during our review of journal entries within the Core Financial Module, we continued to note certain data element fields were either missing information or the information was inaccurate. For example, in some cases, we noted that NASA had not included the business area, purchase order, or vendor within the system for certain entries.
- 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*.
- NASA was unable to meet certain requirements to ensure compliance with federal accounting standards. For example, NASA does not have a process and controls surrounding how it identifies and estimates environmental cleanup costs in accordance with Statement of Federal Financial Accounting Standards (SFFAS) No. 6, *Accounting for Property, Plant, and Equipment*.

Our Report on Internal Control, dated November 12, 2008, includes 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 generally 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. We did not audit management's comments and accordingly, we express no opinion on them.

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, Government Accountability Office, and Congress, and is not intended to be and should not be used by anyone other than these specified parties.

Ernst & Young LLP

November 12, 2008

Management Response to Audit Report of Independent Auditors

National Aeronautics and Space Administration
Headquarters
Washington, DC 20546-0001

November 14, 2008

Reply to Attn of: Office of the Chief Financial Officer

TO: Inspector General

FROM: Deputy Chief Financial Officer

SUBJECT: Management Response to Audit Report of Independent Auditors

I appreciate the efforts of the Office of Inspector General (OIG), and of the Independent Auditors under contract to the OIG, to audit the National Aeronautics and Space Administration's (NASA) FY 2008 financial statements. I understand that due to weaknesses in NASA's financial management processes and systems and internal control weaknesses in property accounting, principally relating to assets capitalized in prior years, the independent auditor has determined that there was insufficient evidential support for the amounts presented in the Agency's financial statements. Therefore, the auditor did not express an opinion on the consolidated balance sheets as of September 30, 2008 and September 30, 2007, and the related consolidated statements of net costs and changes in net position, and the combined statements of budgetary resources for the fiscal years then ended.

The Report on Internal Control identified two modified repeat material weaknesses that continue to be challenges for the Agency: Financial Systems, Analyses, and Oversight; and, Enhancements Needed for Controls over Legacy Property, Plant, and Equipment and Materials Contracts. The Report also noted NASA's significant progress in:

- Identifying issues requiring immediate management attention, including systems concerns and data issues, through NASA's Comprehensive Compliance Strategy and Continuous Monitoring Process.
- Improving financial statement preparation processes.
- Resolving long term data issues.
- Improving accountability over property with the implementation of a new policy and a new financial system property module.

NASA will continue to build upon the progress made in order to address these noted weaknesses.

Terry Bowie

Part 4: Other Accompanying Information

National Aeronautics and
Space Administration

Office of Inspector General
Washington, DC 20546-0001

November 10, 2008

TO: Administrator

FROM: Inspector General

SUBJECT: NASA's Most Serious Management and Performance Challenges

As required by the Reports Consolidation Act of 2000, this memorandum provides our views of the most serious management and performance challenges facing NASA. We continue to use this forum as a means to draw attention to areas within the Agency's key programs and operations that need to achieve greater economy, efficiency, effectiveness, and accountability. In determining whether to report an issue as a challenge, we consider the significance of the programmatic, institutional, and external concerns in relationship to the Agency's mission; susceptibility to fraud, waste, and abuse; whether problems are systemic; and whether there are safety issues that could result in injury or loss of life.

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), NASA is working to improve Agency programs and operations and address the following challenges:

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

- **Managing Risk to People, Equipment, and Mission.** Ensuring that effective risk management, safety, and mission assurance controls are in place to provide robust and reliable operations in the context of very challenging mission schedules and budget constraints.

- **Financial Management.** Ensuring that the Agency implements the appropriate processes, controls, and resources to improve NASA's ability to efficiently provide reliable information to management; address continuing problems, such as NASA's internal control over property, plant, and equipment (PP&E); and comply with the Chief Financial Officers Act and other Federal requirements.

- **Acquisition and Contracting Processes.** Ensuring that adequate requirements and cost estimates are developed, program costs are adequately managed, and the most advantageous acquisition and procurement strategies and safeguards are in

place to promote competition and ensure programs and projects are within schedule and performance parameters.

- **Information Technology (IT) Security.** Continuing efforts to address management, operational, and technical weaknesses and to implement effective controls to protect the information and information systems vital to the Agency's mission.

NASA's greatest challenge remains the transition from Space Shuttle operations to Constellation Program implementation. Although the 2004 "President's Vision for U.S. Space Exploration" tasked NASA with retiring the Shuttle while simultaneously developing and deploying the capability to sustain human and robotic exploration to the Moon and beyond, restrictive budgets, technological hurdles, and geopolitical considerations have complicated programmatic decisions along the way. Thorough and detailed planning is required to coordinate the multitudes of interrelated schedules needed to smoothly transition human capital and critical skills, real and personal property, and related capabilities to support projects within the Constellation Program without compromising the safety and effectiveness of Shuttle operations.

Schedule pressures, from the Shuttle being essential to complete the International Space Station (ISS) before the planned 2010 retirement to convening Constellation Program life-cycle reviews on the defined timeframes, continuously reshape NASA operations. NASA needs to guard against maintaining a schedule at the expense of accepting undue risk. NASA must maintain a robust process for voicing safety and engineering concerns while balancing schedule pressures with the demands of mission execution.

Human capital assets are the backbone on which NASA is reliant for the successful accomplishment of its missions. Balancing the simultaneous requirements of safely flying and then retiring the Shuttle, hiring a workforce capable of managing the Constellation Program from development to implementation, and maintaining an experience base throughout the planned 5-year gap in U.S. space flight capability with the necessary skills to safely operate Constellation Program assets is a challenge that continues to weigh heavily on Agency officials at all levels.

We note that some members of Congress are interested in extending Shuttle flights beyond those currently scheduled. The NASA Authorization Act of 2008 includes language that directs NASA not to take any action that would prevent the Shuttle from flying beyond 2010. Any action taken to extend the Shuttle would be inconsistent with the plan NASA has executed for almost 5 years, which was dependent on Shuttle retirement in 2010. In 2003, the Columbia Accident Investigation Board (CAIB) concluded that "recertification . . . is essential if the Shuttle is to continue operating for another 10 to 20 years." The CAIB's recommendation was that, "[p]rior to operating the Shuttle beyond 2010, develop and conduct a vehicle recertification at the material, component, subsystem, and system levels." While many Shuttle improvements have been made over the past 5 years, the in-depth and costly processes associated with recertification have not been undertaken because the plan has been to end the program by

2010. This is but one example of many complicated and interrelated problems associated with continuing to operate these 1980s vehicles, designed and built with 1970s technology, beyond 2010. The Agency is currently conducting a Shuttle extension study to identify what additional work will be required if Shuttle operations are extended.

The scope of the Constellation Program's development challenges extend to technical and research challenges. Thrust oscillation; the establishment, definition, and refinement of requirements; and research into the effects of long-duration space flight on humans are among the technical issues currently challenging the successful development of Constellation Program assets. NASA must be vigilant in its process of establishing and validating project requirements. Program risks increase when contractual obligations are established prior to the completion of research that would help define requirements. A disciplined approach using established life-cycle reviews should provide decision makers the knowledge needed to make informed decisions.

NASA's financial management remains on the list of challenges because of continued significant weaknesses in NASA's financial management processes and systems, including issues related to internal control over property accounting. These deficiencies have resulted in a disclaimer of opinion on NASA's financial statements since FY 2003. Many of the deficiencies disclosed by the independent public accounting firms' audits resulted from a lack of effective internal control procedures and from data integrity issues. Although NASA has made progress in addressing these deficiencies, the FY 2008 audit of NASA's financial statements disclosed that similar deficiencies still exist.

Two of the most significant deficiencies involve the financial statement preparation process and NASA's internal control over PP&E. NASA's financial statement preparation process contains deficiencies in Agency-wide internal control, which impaired NASA's ability to report accurate financial information on a timely basis. NASA's ongoing PP&E weakness has been improved through the implementation of new policies and procedures in FY 2008. However, certain legacy accounting issues related to the ISS and the Shuttle continue to impair NASA's ability to accurately report financial information related to PP&E. NASA's challenge will be to ensure its newly implemented processes and controls are operating effectively to accurately record capitalized property in a timely manner.

NASA also continues to face acquisition and contracting challenges. Over the past several years, the Agency has been addressing project management and contracting process weaknesses and has made progress in implementing a more disciplined approach. However, NASA continues to encounter cost overruns in major programs and projects that in many instances are due to ineffective cost-estimating processes used to provide the information necessary to establish priorities and quantify risks. Although NASA has made fundamental improvements to its acquisition approach, weaknesses in the execution of that approach continue to be reflected in the application and timing of project milestone events and NASA's inability to fully define project requirements prior to entering into contractual arrangements.

The Agency has also made commendable progress in the establishment of an Acquisition Integrity Program. However, we continue to report on the existence of management weaknesses in the prevention of conflict of interest violations, with some violations resulting in criminal convictions. We believe that the Agency's commitment to ethics is essential to NASA's ability to effectively and efficiently execute the Agency's mission. Through the establishment of the Acquisition Integrity Program, NASA has taken positive steps to address weaknesses in acquisition and contracting, and we believe that NASA's continued focus in these areas and on ethics compliance and awareness will yield even more improvements.

During FY 2008, NASA's Office of the Chief Information Officer (OCIO) reported making progress against the corrective action plan for IT security and worked diligently to address known weaknesses and implement effective management, operational, and technical controls intended to protect the information and information systems vital to the Agency's mission. In addition, the OCIO reported substantial progress with Federal Information Security Management Act (FISMA) requirements, to include 97 percent of non-national security systems being reported as certified and accredited.

We independently assessed the Agency's actions taken to improve IT security and found that although the Agency has made significant progress, much work remains to ensure adequate management focus and completion of planned security actions. Based on the results of our review, we believe that the OCIO should focus its efforts in the coming year on issuing clearer guidance, better oversight of external systems, and ensuring end-to-end visibility and monitoring of NASA networks and systems. Therefore, to ensure continued focus on IT security deficiencies as well as ensure that sufficient management attention and adequate resources are provided, we continue to report IT security as a management and performance challenge.

In FY 2009, the OIG will continue to conduct work that focuses on NASA's efforts to meet these challenges as part of our overall mission to promote the economy and efficiency of the Agency and to root out fraud, waste, abuse, and mismanagement. If you have any questions, or need additional information, please call me at 202-358-1220.

signed

Robert W. Cobb

Enclosure:
NASA's Most Serious Management and Performance Challenges

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 Vision for U.S. Space Exploration" in 2004, NASA was directed to return the Space Shuttle to flight as soon as practical, focus the use of the Shuttle on completing the International Space Station (ISS), and retire the Shuttle by 2010. One of NASA's greatest challenges associated with achieving the President's Vision is maintaining the capabilities required to fly the Shuttle safely and effectively while transitioning human capital and critical skills, real and personal property, and related capabilities to support projects within the Constellation Program without compromising Shuttle operations. Over the past few years, many oversight and evaluative bodies, such as the National Research Council (NRC), the Government Accountability Office (GAO), and the NASA Office of Inspector General (OIG), have reported on various aspects of the Constellation Program and the transition. These bodies continue to monitor NASA's progress at the request of the Agency and Congress.

Constellation Program. The President's Vision tasked NASA with developing and deploying the capability to sustain human and robotic exploration to the Moon and beyond. Restrictive budgets and technological hurdles have forced NASA to delay some of the Constellation Program's milestones. The target date of the Orion crew exploration vehicle's first piloted flight moved from 2013 to 2014, which will likely require modification to the existing contracts and impact planned testing of that first piloted flight. Based on recent funding history and budget requests, NASA estimates that the chance of Constellation meeting its initial operational capability commitment date of 2015 is about 65 percent.

As NASA continues to move toward advancing piloted space exploration while leading the world in aviation and space innovation, NASA must be vigilant in its pursuit of defining and establishing the requirements necessary to accomplish a smooth transition successfully. However, NASA is still in the process of defining many requirements for the Constellation Program and continues to be negatively impacted by requirements being developed concurrently with program implementation decisions. Additional program risks are imposed when NASA enters contractual arrangements for work before having clearly defined requirements, which could result in increased costs and schedule delays.

System engineering and integration challenges continue to test the analytical abilities of NASA engineers. Throughout last year, engineers for the Ares I rocket, the crew launch vehicle being designed to take Orion into space, were focused on resolving a thrust oscillation problem that had some analysts predicting that potentially dangerous vibration could occur in the Orion cabin. Engineers recently presented NASA senior management their final recommendations for fixing the problem, which could add weight to the rocket

and crew vehicle combination. Critics are concerned about how the two projects (Ares I and Orion) may be affected, although NASA engineers insist that the combination retains enough weight margin to accommodate the proposed fix for the thrust oscillation problem. However, additional unanticipated complexities, such as mass and weight changes or changes to power load requirements, raise the risk that the Constellation Program could suffer from additional cost and schedule pressures. Taking a disciplined approach to ensure adequate and appropriate review at each life-cycle phase should provide key decision makers the information and assurances necessary for them to make informed decisions.

NASA must also strive to better understand the effects of long-duration space flight on human performance. While researchers have gained a tremendous amount of information from long-duration human missions, such as those carried out on the ISS, many questions remain. An NRC panel reported that NASA may have focused too much attention on short-term goals and may not be effectively applying sufficient resources toward numerous human risk factors nor developing technology vital to long-duration lunar missions and to reaching Mars. The NRC panel also cited NASA's neglect of nuclear thermal propulsion, a technology crucial to successfully accomplishing longer human missions. Nuclear thermal propulsion could result in a round trip to Mars being less than 500 days instead of the currently projected 900. As NASA gets closer to 2015 and the expectation of using Orion for human space flight, NASA must continue its research and development of new technologies that will keep the crew healthy and safe while maintaining performance requirements of the Ares I/Orion combination, including the physical constraints of mass, power, and weight.

Managing the Transition. As the last currently scheduled flight of the Space Shuttle in 2010 approaches, management of the transition between Shuttle operations and the first projected human space flight in 2015 will become increasingly detailed. NASA must maintain the capabilities required to fly the Shuttle safely and effectively while transitioning human capital and critical skills, real and personal property, and related capabilities to support projects within the Constellation Program. In addition, the need to adequately support activities aboard the ISS during the projected 5-year gap in U.S. space flight capability continues to be of great concern.

During FY 2008, Congress, GAO, and other external entities have focused on certain aspects of the transition effort: the effects of the period between the last Shuttle flight and the first Orion flight, on NASA's civil service and contractor workforce, and on the sustainment of the ISS. Workforce issues include maintaining the critical skills now present in the Shuttle workforce throughout the Shuttle's remaining flights while placing additional emphasis on defining and cultivating the skill sets needed by the Constellation Program, especially those that will be needed at Kennedy Space Center. Although other NASA Centers are engaged in development and production activities for the new vehicles, the primary focus of the Kennedy workforce is launch and maintenance—activities that will not be needed at full capacity until the new crew exploration vehicles are ready for flight. GAO and the OIG are also working together to monitor the transition of facilities and hardware, in addition to reviewing the development of the next generation space vehicles and supporting equipment.

While NASA remains committed to a successful and smooth transition from the Space Shuttle to the Constellation Program, international concerns also remain as obstacles to the success of the President's Vision. Sustaining the ISS during the gap period is crucial to realizing the scientific research potential of the ISS and protecting the extensive U.S. and foreign investments in the ISS. NASA had planned to rely on international partners and commercial providers for logistics support and crew rotation necessary to sustain and operate the ISS during the gap period. However, the current capabilities of commercial transportation, constrained schedules, and funding requirements for NASA's Constellation Program diminish the hope of readily available transportation for crew members and cargo to and from the ISS during the planned gap. The lack of adequate support could seriously impair the utility of the ISS as a scientific research asset for the United States and partner nations if Congress and NASA do not commit sufficient resources to ensuring that logistics support can be realized after the final flight of the Space Shuttle.

Although plans have been developed that could conceivably delay the Shuttle's retirement in order to fill the U.S. space flight gap past 2010, implementing those plans is likely to be expensive. In 2003, the Columbia Accident Investigation Board recommended that, as part of a Service Life Extension Program, NASA should recertify the Shuttle at the material, component, system, and subsystem level prior to operations beyond 2010. Shuttle managers forecast that, after 2010, there will be no spares available for auxiliary power unit gas generators, hydraulic actuators, and other critical hardware. In addition, Shuttle managers reported that 2 years ago NASA began terminating contracts with the majority of vendors providing Space Shuttle parts, including the Space Shuttle Main Engine and External Tank contracts. Shuttle suppliers have already begun retooling efforts, and convincing suppliers to again produce unique specialty items based on 30-year-old technology is likely to come at a premium price.

The Administrator, recognizing the significance of the transition being properly managed, directed that the Space Shuttle retirement plan and progress be included routinely in the agenda for NASA's quarterly Senior Management Council meetings, to include transition metrics, decisions, and impacts on facilities. This attention on transition management at the most senior levels of the Agency is sound, but major challenges remain. GAO recently reported that NASA is still facing challenges in defining the full scope and cost of the Shuttle transition and retirement activities. For example, GAO stated that NASA has not developed final plans or cost estimates for making artifacts, such as the orbiters, safe for public display. However, NASA plans to include more mature transition and retirement estimates in its next budget submission.

Managing Risk to People, Equipment, and Mission

Effective risk management, safety, and mission assurance controls are key to supporting robust and reliable operations in the context of very challenging launch and mission schedules. NASA programs are constantly confronted by risks introduced by fiscal constraints and schedule demands. International and commercial partnerships also

involve risks due to the ever-changing geopolitical environment and U.S. economic constraints. Close scrutiny by NASA management of adherence to the fundamentals of project and program management, risk identification and mitigation, and proven acquisition strategies is beneficial toward the accomplishment of Agency goals.

Schedule Challenges. Schedule pressure to complete the ISS by 2010 is substantial. NASA must guard against schedule pressure manifesting itself in the acceptance of undue risk. NASA's robust logistic planning, ensuring the delivery of major ISS hardware before it is needed, can ease some of the schedule pressure experienced. As NASA continues to make changes to the Shuttle flight schedule, NASA must also continue to adequately safeguard the Shuttle's workforce and infrastructure through a rigorous and multilayered review process. We recognize that it is a serious performance and management challenge for the Agency 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. However, a process that achieves anything less is unacceptable.

Technical Challenges. Technical issues continue to challenge the Shuttle Program and add risk to mission success. Specifically, NASA has been addressing the reliability of the fuel tank's engine cutoff sensors and the continued danger posed by the shedding of foam insulation from the external fuel tank. Undoubtedly, there will be unforeseen technical challenges that will need to be addressed as long as the Space Shuttle continues operations. The added schedule and fiscal stresses of meeting these technical challenges are compounded by those involved in developing and maintaining the Constellation Program's acquisition schedule.

Sound program and project management principles, technical and safety risk identification, and sound mitigation strategies are paramount to successfully developing and operating programs and projects that push the envelope of technological advancement. For the next fiscal year, the OIG plans to dedicate considerable resources to reviewing the Agency's risk management efforts at the program and project levels. Our focus will include monitoring NASA's implementation of requirements detailed in the NASA Policy Directive 7120 series, Program/Project Management, and the implementation of GAO best practices and OIG recommendations.

Budgetary Challenges. Aside from the tremendous schedule and technical challenges associated with retiring the Shuttle in 2010 while simultaneously developing the next generation of space vehicles, accomplishment of those missions is susceptible to budgetary constraints imposed through the appropriation process. The implications associated with this budgetary reality add ever-increasing risk to an organization responsible for leading the Nation in space and aeronautics research and development and whose programs are designed to operate over several decades.

Budget constraints and the emphasis on implementing the President's Vision, National Academy of Sciences recommendations, and other stakeholder priorities also influence operations within the NASA Directorates not directly involved in the Constellation Program. While the major space exploration and operational program challenges

continue to be a difficult balancing act, other Mission Directorates within NASA, such as the Aeronautics Research Mission Directorate (ARMD) and the Science Mission Directorate (SMD), certainly feel the impact. For example, the Landsat Data Continuity Mission and Global Precipitation Measurement projects have been unable to move past the formulation phase for the past decade. Research and development activities for the Next Generation Air Transportation System have also been influenced by decreasing ARMD budgets. NASA has had to fund these projects at less than optimal levels in order to support shifting budget priorities imposed by Congress and react to recommendations from external entities.

Decreasing ARMD budgets over the past decade have also forced ARMD to focus its efforts more toward fundamental research, leaving the application of that research to industry and operational developers. This focus has the potential to cause technological readiness gaps between NASA's fundamental research work and the technological maturity expected by partner agencies. Close and detailed coordination will be required to ensure the seamless transfer and implementation of new technologies into the operational environment.

Despite many successful Shuttle missions, the tragic loss of life in the Columbia and Challenger accidents and the risk-adverse nature of society today have raised some questions about the benefits of space exploration. Although NASA's programs have advanced the Nation's knowledge in science and technology, the debate over the cost to implement the President's Vision is emblematic of the challenge NASA will face as congressional interest continues and the Administration changes.

Key Partnerships. International and commercial partnerships are vital to implementing the President's Vision. Such partnerships involve risks that include changes in U.S. foreign relations policy and economic constraints.

While the President's Vision directs NASA to pursue opportunities for international partnerships in support of the Nation's exploration goals, Congress has raised concerns about the reliability of Russia to remain a partner for the ISS and the related provision of crew delivery service to and from the Space Station. Currently, the U.S. purchase of transportation services using the Russian Soyuz spacecraft is permissible through a waiver of the Iran, North Korea, and Syria Nonproliferation Act. On September 30, 2008, President Bush signed a temporary spending bill that included an extension of the waiver to 2016, enabling NASA to continue purchasing seats for astronauts going to the ISS.

NASA is also facing significant challenges in its plan to honor its commitments to deliver cargo. NASA plans to rely on the commercial sector to develop space vehicles to use for cargo delivery once ISS assembly is complete and to help the United States honor its international commitments. However, delays in the Commercial Orbital Transportation Services Program and the likely unavailability of U.S. crew vehicles increase the likelihood that NASA will be forced to rely on international partners and the Russian Soyuz spacecraft to transport cargo and crew to the ISS. Although the President granted a waiver to the Iran, North Korea, and Syria Nonproliferation Act, the Soyuz has recently

experienced hard landings as the result of ballistic reentry, which have raised questions as to the spacecraft's safety. NASA is actively working with Russia on modifications to the reentry profiles and continues to monitor the situation.

Financial Management

Since FY 2003, NASA has not been able to produce auditable financial statements or provide sufficient evidence to support statements throughout the fiscal year. NASA has received a disclaimer of opinion on its financial statements from the independent public accounting (IPA) firms conducting the audits: PricewaterhouseCoopers (PwC) in FY 2003 and Ernst & Young LLP (E&Y) in FYs 2004 through 2008. These audit reports identified instances of noncompliance with generally accepted accounting principles (GAAP), reportable conditions,[1] material weaknesses in internal control, and noncompliance with the Federal Financial Management Improvement Act of 1996 and the Improper Payments Information Act of 2002. Many of the deficiencies the audits disclosed resulted from a lack of effective internal control procedures and from data integrity issues. Although NASA has made progress in addressing these deficiencies, E&Y noted similar deficiencies during the FY 2008 audit of NASA's financial statements. Two of the most significant deficiencies involve NASA's financial statement preparation process and internal control over property, plant, and equipment (PP&E). As shown in the following table, these deficiencies have been reported for several years.

[1] The term "reportable condition" was replaced by "significant deficiency," effective for FY 2007 reporting, with the issuance of Statement on Auditing Standards No. 112, "Communicating Internal Control Related Matters Identified in an Audit."

Internal Control Deficiencies						
Fiscal Year		2008	2007	2006	2005	2004
Independent Public Accountant		E&Y	E&Y	E&Y	E&Y	E&Y
Audit Opinion		Disclaimer	Disclaimer	Disclaimer	Disclaimer	Disclaimer
Internal Control Deficiencies	General Controls Environment[a]	—	—	—	—	material weakness
	Financial Statement Preparation Process and Oversight	material weakness	material weakness	material weakness	material weakness	material weakness
	Property, Plant, and Equipment	material weakness	material weakness	material weakness	material weakness	material weakness
	Fund Balance with Treasury[b]	—	—	—	material weakness	material weakness
	Environmental Liability Estimation[c]	—	—	—	reportable condition	reportable condition

[a] The General Controls Environment weakness had mostly been resolved by FY 2005. The segregation of duties component of this weakness was subsequently included in the Financial Statement Preparation Process and Oversight weakness for FYs 2005–2008.

[b] The Fund Balance with Treasury reconciliations weakness cited in FY 2005 had mostly been resolved by FY 2006; 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 and was resolved in FY 2007.

[c] The deficiency cited for Environmental Liability Estimation had mostly been resolved by FY 2006. Control deficiencies surrounding the software application used to prepare the estimates, and a lack of involvement by the appropriate Office of the Chief Financial Officer in related accounting matters was included in the Financial Statement Preparation Process and Oversight weakness for FYs 2006–2008.

Financial Statement Preparation Process and Oversight. NASA has made progress in improving its internal control over financial reporting during FY 2008. NASA developed the Comprehensive Compliance Strategy (CCS) to focus on ensuring compliance with GAAP and other financial reporting requirements. The CCS also covers the standards and requirements necessary to resolve deficiencies noted in recent audit reports and other communications from independent entities, such as GAO. The CCS serves as the basis for implementing comprehensive, proactive corrective actions Agency-wide and is being implemented through a phased approach that is being executed on a continuous basis. NASA uses its Continuous Monitoring Program (CMP) to assess and evaluate internal controls, compliance with GAAP, and evidence that balances and activities reported in its financial statements are accurate and complete by requiring Centers to perform a set of control activities. It is NASA's expectation that the use of the CCS and the CMP will resolve its deficiencies. However, NASA management and E&Y continued to identify weaknesses in Agency-wide internal controls, which impair NASA's ability to timely report accurate financial information.

E&Y found that certain issues had been identified within the Centers' CMP submissions to Headquarters but that those issues were not resolved in a timely fashion. Delays in correcting self-identified issues are a recurring matter at the Agency. Also, Headquarters personnel were not aware that the Centers were not performing certain specified control activities or that the Centers had implemented alternative procedures. Insufficient

oversight by Headquarters personnel may result in untimely or ineffective implementation of corrective actions and an increased risk that the Centers may fail to timely detect misstatements or inaccuracies in their financial records. Consequently, these misstatements may become part of the Agency's financial statements. In addition, E&Y identified certain weaknesses in performing the CMP at the Centers that could impair NASA's ability to correct material errors in a timely fashion. For example, the results of certain control activities performed by the Centers were not properly reported to Headquarters. Also, some control activities were not completed in accordance with the applicable CMP guidance. Instead, the Centers implemented alternative procedures. Failure to properly perform the CMP control activities could result in lack of, or untimely, completion or correction of material issues, leading to errors within the Agency's financial statements.

In accordance with Office of Management and Budget Circular No. A-123, "Management's Responsibility for Internal Control," Appendix A, "Internal Control Over Financial Reporting," the Agency assessed, documented, and drafted a report on its internal control over financial reporting. NASA found a number of significant deficiencies[2] noted primarily in three processes: Cost Management, Procurement and Payment Management, and Revenue and Receivables Management. These significant deficiencies were mostly due to lack of documentation retention, lack of supervisory review, and various other issues related to completion of activities related to the CMP, such as reconciliations. Internal control deficiencies[3] were also noted throughout many of the processes. These internal control deficiencies were primarily due to inadequate documentation of reconciliations and insufficient retention of supporting documentation.

Property, Plant, and Equipment. To address the PP&E material weakness, NASA implemented new PP&E capitalization policy and procedures, effective October 1, 2007. The policy and procedures are intended to ensure that the value of capitalized assets going forward will be accurate. NASA costs associated with capitalized PP&E are accumulated in the relevant PP&E Work Breakdown Structure (WBS) elements within the Core Financial module, which should enable NASA to identify, track, and accumulate the costs associated with the value of capitalized PP&E. For contracts with effective dates on or after October 1, 2007, contractors are required to report the cost of each capitalized asset as a separate item on required contractor cost reports. NASA also designed a process to reconcile the monthly contractor cost reports and the capitalized PP&E amounts recorded in NASA's Contractor-Held Asset Tracking System (CHATS) and the Core Financial module. However, the deficiencies E&Y noted during the

[2] A significant deficiency is a control deficiency, or combination of internal control deficiencies, that adversely affects the agency's ability to initiate, authorize, record, process, or report external financial data reliably in accordance with GAAP such that there is more than a remote likelihood that a misstatement of the agency's financial statements, or other significant financial reports, which is more than inconsequential, will not be prevented or detected. Significant deficiencies do not have to be reported outside of the agency; however, they should be reported internally for management's consideration and require corrective action plans for remediation.

[3] An internal control deficiency exists when the design or operation of a control does not allow management or employees, in the normal course of performing their assigned functions, to prevent or detect misstatements on a timely basis.

FY 2008 audit fundamentally flow from contracts executed prior to the implementation of NASA's new capitalization policy. For these types of contracts, NASA waited to obtain disbursement data for capitalization, instead of predetermining the amounts of property it expects to buy, has contracted for, or has purchased. Management also integrated and expanded PP&E validation procedures into the monthly CMP. Management is currently making further revisions to the PP&E sections within the CMP, including the contractor-held PP&E validation checklists. While progress has been made for new property acquisitions, legacy accounting issues related to the ISS and the Shuttle will continue to impair NASA's ability to report financial information related to PP&E.

In May 2008, NASA implemented the Integrated Asset Management (IAM)/PP&E module to track and value NASA's capitalized personal property. The IAM/PP&E module within the Integrated Enterprise Management Program is capable of uploading contractors' PP&E data from CHATS once NASA's validation procedures have been completed. This should minimize the risk of errors that previously existed when CHATS data was exported to an Excel document in support of manual journal vouchers to record contractor-held PP&E. However, E&Y noted that NASA capitalized, through contractor-held work-in-process reported in CHATS, approximately $1.3 billion for a project that was determined to be research and development according to the new capitalization policy. It was E&Y's understanding that NASA removed those amounts from the capitalization balance when preparing the financial statements.

Next Steps. Although much progress has been made in developing policies, procedures, and controls to address NASA's financial internal control deficiencies, NASA's challenge will be to ensure its newly implemented processes and controls are operating effectively to accurately record capitalized property in a timely manner. The Agency must also 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 by E&Y, the OIG, and GAO.

Acquisition and Contracting Processes

One of NASA's longstanding management challenges relates to systemic weaknesses identified in its acquisition and contracting processes. GAO first identified NASA's contract management as a high-risk area in 1990, citing NASA's undisciplined cost-estimating processes in project development and the project managers' inability to obtain information needed to assess contract progress. The GAO noted improvements to NASA's processes in its most recent update to the high-risk areas, "High Risk Series: An Update" (GAO-07-310, January 2007). During 2008, the OIG also noted NASA's continued progress toward implementing disciplined project management processes. However, both GAO and OIG audits and investigations continue to reveal systemic issues in the areas of acquisition and procurement.

Cost Estimates. In a recent review of selected NASA programs, GAO found that NASA still lacks the disciplined cost-estimating processes and financial and performance management systems needed to establish priorities, quantify risks, and manage program costs. GAO noted that the Agency will continue to face challenges in effectively overseeing its contractors until it 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. Recently, NASA has reported cost overruns on some of its major programs, including the Mars Science Lab, which could impact the success of other programs whose funding may be redirected.

In another recent review, GAO reported that NASA faces disparate challenges in estimating the cost to retire the Space Shuttle and transition to the Constellation Program. Although NASA expects to retire the Shuttle in 2010, it has yet to decide which facilities and equipment will transition to the Constellation Program and which will be sold, demolished, or preserved for historic value. Proper estimation of the cost to transition and dispose of its facilities and assets are critical to the long-term financial planning for the Constellation Program. According to GAO, NASA will need to determine the status of as many as 654 facilities worth an estimated $5.7 billion and equipment estimated at $12 billion. According to NASA officials, the Agency is working on two major initiatives to address these challenges.

During our audit of the FY 2008 budget request for NASA's Constellation Program, we found that the cost estimates used to support the budget request could have been better documented. We noted that NASA could improve its budgeting process by adopting the standards recommended by the GAO's July 2007 exposure draft, "Cost Assessment Guide: Best Practices for Estimating and Managing Program Costs," and ensure that budget requests incorporate supportable cost estimates based on historical or actual cost data, vendor quotes, and spreadsheets with detailed calculations prepared by subject matter experts showing how they arrived at the cost estimates.

Acquisition Process. GAO and OIG audits have continued to report systemic issues involving NASA's acquisition process. Given that NASA spends approximately 85 percent of its budget on contracts, these systemic weaknesses pose significant challenges to NASA's ability to make informed investment decisions. In response to these challenges, NASA revised its acquisition policy in 2007, which was a positive step in improving NASA's ability to complete its programs and projects within cost, schedule, and performance parameters. However, implementation of the revised policy has created its own challenges by fundamentally changing NASA's approach to acquisition.

More than 2 years ago, GAO testified that NASA's acquisition strategy of awarding a long-term contract for the design, development, production, and sustainment of Orion before developing a sound business case placed the project at risk of significant cost overruns, schedule delays, and performance shortfalls. Later, in October 2007, GAO noted that gaps in the Ares I Project included inadequate knowledge of requirements, costs, schedule, technology, design, and production feasibility. GAO also noted that, given the complexity and interdependencies of the Constellation Program, these challenges were significant.

In June 2007, the OIG initiated an audit of the Orion Project because it was one of the first space flight projects to implement the revised policy, which requires space flight projects to conduct life-cycle reviews during each phase of the project's life cycle. These reviews are considered essential elements of conducting, managing, evaluating, and approving space flight projects. However, during our audit of the Orion Project, we found that NASA conducted a life-cycle review with a vehicle configuration that was not at the proper maturity level to proceed to the next phase. As a result, a significant portion of the vehicle configuration that eventually did proceed to the next phase had not been completely evaluated for compliance with requirements, which increased the risk of costly rework and schedule delays.

In April 2008, GAO again testified that while NASA was working toward a preliminary design review for Ares I and Orion, there were considerable unknowns as to whether NASA's plans could be executed within schedule and cost parameters because NASA was still in the process of defining many performance requirements. While GAO stated that NASA would be challenged to meet the schedule given the level of knowledge that still needed to be attained, GAO also noted that NASA had recognized the risks involved with its approach and had taken steps to mitigate some of those risks.

Standards of Ethical Conduct Compliance. There is great proximity between NASA and the private sector, including both industry and academia. With approximately 85 percent of NASA's budget being dedicated to contracts, there is great incentive for private sector interests to influence NASA employees. There is also substantial interaction between NASA's scientists and researchers and those with non-governmental entities, and incentives abound for such acts as sharing information that is sensitive but unclassified. Many NASA employees often seek opportunities in the private sector to pursue financial opportunities beyond their Government employment. With the interchange of talented personnel between the public and private sectors, the advent of term appointments, the use of Intergovernmental Personnel Act appointments, and the use of contractors to meet personnel needs, management is challenged to ensure that ethics laws and regulations applicable to each category are identified and followed. It is imperative that NASA employees, as stewards of NASA's mission and budget, are aware of and comply with the applicable ethics laws and regulations.

We believe that the Agency's commitment to ethics is crucial to maintain the confidence of Congress and the taxpayer so that NASA can fulfill its mission to further science and technology and to explore the universe. The consequences of not having a strong commitment to ethics or of having a workforce that does not embrace a culture of ethical compliance not only undermines the public's trust in Government but inherently causes a further disruption in Agency programs, given the host of consequential activities such as bid protests, contract cancellations, and inquiries by the investigative arms of Congress as well as the OIG.

We also note the Office of the General Counsel's commitment to ethics compliance and awareness, as the Office expanded its resources in the past 2 years to focus on acquisition integrity. Nevertheless, ethics issues, for the Agency as a whole, still accounted for a significant number of cases and allegations examined by the OIG's Office of

Investigations in recent fiscal years. Several of those investigations led to criminal convictions of NASA employees, but also caused protracted procurements. Examples of such ethics-related investigations undertaken by the Office of Investigations include the following:

- NASA employees accepting gifts and meals from a contractor.
- NASA employees' use of public office to advance private business interests.
- A NASA employee who knowingly leaked procurement sensitive information to a contractor. NASA management, after being informed of this, reprimanded the employee, but then temporarily promoted the employee to greater responsibility and also nominated the employee for an Agency award covering the same time period that the information was leaked.
- NASA contracting officer's technical representatives (COTRs) accused of obtaining contracts, in their personal capacities, from the very NASA contractor they were tasked to oversee.
- A NASA employee accused of influencing funding issues for a private sector entity with which the employee had a consulting relationship.
- A NASA employee, as a member of a Source Selection Board, evaluating a private sector company with which the employee was recently employed.
- A former NASA employee accused of using a budget under the employee's control when employed by NASA to award sole-source contracts to private sector entities for which the employee subsequently became a consultant.
- A NASA Standing Review Board (SRB) member reviewed a contract's technical requirements (source selection information) while working for a private sector company that competed for the NASA contract.

Although most of the examples are still under investigation, and may or may not be violations of applicable laws or regulations, they are emblematic of the types of allegations that arise with a technical workforce that works closely with the private sector in order to accomplish NASA's mission. In the fourth example, NASA had to cancel a contract and re-procure services; two NASA COTRs were convicted of violating criminal conflict of interest laws.

The OIG also completed an audit related to the establishment of the Orion Project's SRB. NASA establishes SRBs because having projects reviewed by a group of independent experts provides a unique view that may have been overlooked by project personnel. However, to provide an impartial opinion to NASA management, SRB members should be independent of the project. We found that 6 of the Orion SRB's 19 members were not fully independent of the Orion Project. Those 6 Orion SRB members were employees and, in 4 cases, were also stockholders of companies having contracts for Orion work. This occurred because NASA's internal control processes for triggering conflict of

interest and ethics review were deficient. For example, had NASA initially determined that the Orion SRB was an advisory committee subject to the Federal Advisory Committee Act (FACA),[4] NASA's ethics process associated with advisory committee participation would have been triggered, resulting in a focus on board member independence and conflict of interest resolution. Because of their employee or stockholder status, those members had a vested interest in the project's success, making it necessary to carefully evaluate their suitability to serve on an advisory board that emphasizes "objectivity and independence." Because of our finding on the Orion SRB, we initiated a review on all Constellation Program SRBs to determine whether similar issues exist. Our preliminary work indicates that similar conflict of interest issues also exist on the other Constellation Program SRBs.

The OIG continues to work with Agency ethics officials to identify and address these issues through both training and enforcement; prudence would dictate that the Agency continue to examine the effectiveness of its ethics training and processes, given the continued numbers of ethics allegations and instances indicated.

Information Technology (IT) Security

Since 2006, NASA has been reporting IT security as a material weakness in the Administrator's annual Statement of Assurance. Demonstrating its commitment to improving its security posture, NASA has worked diligently throughout the year to address known weaknesses and implement effective management, operational, and technical controls intended to protect the information and information systems vital to the Agency's mission.

NASA reported IT security as a new material weakness in the Administrator's FY 2006 Statement of Assurance, issued November 15, 2006, due to recurring IT security deficiencies in areas such as patch management, management of network services, backup of systems, and certification and accreditation of IT systems. NASA continued to report IT security as a material weakness in the Administrator's FY 2007 Statement of Assurance, issued November 15, 2007, based on IT security deficiencies identified during an Agency-wide IT security review by the Office of the Chief Information Officer (OCIO) and ongoing OIG audits and investigations.

During FY 2008, the NASA OCIO reported making progress against the IT security corrective action plan and also reported that NASA was adequately meeting the requirements of the Federal Information Systems Management Act (FISMA). The NASA OCIO stated that the Cyber Threat Analysis Program will "proactively discover and handle sensitive intrusions into NASA's cyber assets." The program includes threat identification, threat reporting, and advanced analysis that includes reverse engineering and data forensics methods. NASA is also in the process of implementing the Security Operations Center Project to consolidate security operations and incident response

[4] As amended, 5 U.S.C. app §§ 1–16.

capabilities and provide the Agency with end-to-end visibility and monitoring of NASA networks and systems. In addition, the OCIO reported substantial progress with FISMA requirements, to include 97 percent of non-national security systems being reported as certified and accredited.

Based on the Agency's progress, the OCIO concluded that IT security was no longer a material weakness that needed to be reported in the FY 2008 Statement of Assurance, provided certain conditions were met. These conditions include continuous and substantiated progress with regard to the IT security corrective action plan and increased visibility into the security posture of mission assets through full implementation of the Security Operations Center, including regularly scheduled compliance reviews.

The OIG performed a limited review to independently assess NASA's actions taken to improve IT security. We found that the OCIO's progress included closing 91 percent of OIG recommendations to improve IT security in FYs 2005 through 2007; establishing the IT Security Program Management Office; establishing the Cyber Threat Analysis Program; revising the incident management program, which included implementation planning for the Security Operations Center; and substantially improving Agency compliance with FISMA requirements. Based on the work we performed, we agree with the OCIO's conclusion that IT security should no longer be reported as a material weakness. However, much work remains to ensure adequate management focus and completion of the planned IT security corrective actions.

As part of our FISMA audit, we reviewed certification and accreditation documentation for 39 of 607 non-national security Agency systems and 6 of 47 non-national security external systems[5] for compliance with FISMA requirements. We found that all 39 Agency systems we reviewed were compliant with FISMA requirements for certification and accreditation. However, only 3 of the 6 external systems complied with certification and accreditation requirements. In addition, we found that the Agency's plan of action and milestones (POA&M) process was not fully compliant with FISMA requirements. Based on the results of our FISMA review, we believe that the OCIO should focus its efforts in the coming year on clearer guidance and management of external systems to ensure compliance with FISMA requirements.

Although the development of a Cyber Threat Analysis Program is representative of the Agency's progress, the Agency is still developing and implementing various other projects involving incident management. For example, the Security Operations Center is in the planning phase and much work remains to be done to meet the current estimated completion date of March 2009. Additional time will also be required to demonstrate the effectiveness of this program.

[5] NASA Standard Operating Procedure, ITS-SOP-0033, "External System Identification and IT Security Requirements," July 19, 2007, defines an external system as an IT system used by NASA to store or process "NASA information that is critical to the mission or operations of NASA. . . . External systems are generally owned by outside agencies, contractors, universities, or other organizations and provide services to other customers besides NASA."

Other challenges the Agency faces include increased sophistication of cyber attack technology, new phishing techniques, and spyware programs that continue to prove ever more damaging with the advancement of technology. For example, the ISS recently was infected by a computer virus intended to gather personal information. The virus was believed to be either in the initial software load or possibly transferred from a personal flash drive. In addition, several NASA Centers continue to experience IT security incidents, which the OIG is investigating. Whether or not the Agency's Cyber Threat Analysis Program and revised incident management program can effectively demonstrate results can only be determined over time.

The NASA OCIO should continue to report quarterly to the Senior Assessment Team until planned actions are fully implemented and demonstrating the desired results. This should ensure continued focus on IT security deficiencies as well as ensure that sufficient management attention and adequate resources are provided. Therefore, we continue to report IT security as a management and performance challenge.

Improper Payments Information Act (IPIA) Assessment

Improper Payment Compliance

The National Aeronautics and Space Administration (NASA) is dedicated to reducing fraud, waste, and abuse by adequately reviewing and reporting programs susceptible to improper payments in accordance with the Office of Management and Budget (OMB) Circular A-123 *Management's Responsibility for Internal Control*, Appendix C, *Requirements for Effective Measurement and Remediation of Improper Payments*. To improve the integrity of the Federal government's payments and the efficiency of its programs and activities, Congress enacted the *Improper Payments Information Act* (IPIA) of 2002 (Public Law No. 107-300). The IPIA contains requirements in the areas of improper payment identification and reporting. It requires agency heads to annually review all programs and activities, identify those that may be susceptible to significant improper payments, estimate annual improper payments in susceptible programs and activities, and report the results of their improper payment activities.

In August 2006, OMB issued Appendix C of OMB Circular A-123—*Requirements for Effective Measurement and Remediation of Improper Payments*. Appendix C supersedes OMB's previous promulgations on improper payments and requires all Executive branch agencies to:

- Review all of its programs and activities to identify those susceptible to significant improper payments. OMB defines significant improper payments as those in any particular program or activity that exceed both 2.5 percent of program payments and $10 million annually.
- Obtain a statistically valid estimate of the annual amount of improper payments in programs and activities.
- Develop corrective action plans and reduction targets for programs/activities found to have significant improper payments.
- Include, in the Performance and Accountability Report (PAR), an estimate of the annual amount of improper payments in programs/activities and the progress in reducing them.

The IPIA defines an improper payment as any payment that should not have been made or that was made in an incorrect amount (including overpayments and underpayments) under statutory, contractual, administrative, or other legally applicable requirements.

NASA's assessment of risk in fiscal years 2004 through 2007 resulted in improper payments less than 2.5 percent of program payments and less than $10 million. With the assistance of contractor support, during fiscal year (FY) 2008, NASA continued its efforts to improve the integrity of its payments and the efficiency of its programs by conducting a risk assessment of its programs and activities. NASA reviewed all of its programs and activities, which totaled $16.7 billion in disbursements. As a result of the risk assessment NASA identified the following eight programs as susceptible to improper payments:

- Constellation Systems
- Earth Systematic Missions
- Institutions & Management
- International Space Station
- James Webb Space Telescope
- Mars Exploration
- Solar System Research
- Space Shuttle

For FY 2007, the risk assessment was conducted on those programs where total disbursements were greater than or equal to $40 million. The $40 million threshold was derived by calculating a maximum improper payment error rate of 25 percent. As a result, three new programs were added: Constellation Systems; Earth Systemmatic Missions; and James Webb Space Telescope.

Total payments related to these programs amounted to approximately $11.5 billion in FY 2007. During FY 2008, with the assistance of contractor support, NASA performed an improper payment review of each program in accordance with Appendix C of OMB Circular A-123 and identified an estimated total of approximately $11,628,187 in improper payments. The IPIA Assessment results indicated that the improper payment amounts and rate by program do not exceed the OMB threshold of both 2.5 percent of program payments and $10 million. Consequently, NASA is not required to prepare a

corrective action plan for this year's PAR. This annual estimate was based on NASA's FY 2007 data (October 1, 2006, to September 30, 2007). Although the testing performed found that the programs did not have significant improper payments, as defined by OMB A-123, Appendix C, NASA will continue to monitor payments and take appropriate corrective action for any such improper payments.

Improper Payments Information Act Reporting Details

The *Improper Payments Information Act* (IPIA) of 2002 requires Federal agencies to review their programs and activities annually to identify those programs that are susceptible to high risk of significant improper payments. The 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 with significant improper payments, report the annual amount of improper payments, and implement corrective actions.

I. Risk Assessment

NASA's risk assessment for FY 2008 was developed using criteria established for determining levels of risk and evaluating all major programs against these criteria. The risk assessment was performed using the process below:

In FY 2008, NASA performed a comprehensive qualitative and quantitative risk assessment of all NASA programs and activities. NASA's risk assessment was conducted to identify those programs susceptible to high risk of significant improper payments. NASA used the following four-step methodology to perform its risk assessment.

(1) Determine Scope of Programs Subject to Risk Assessment

NASA began its risk assessment by determining the population and scope of programs which would be subject to review. NASA derived its initial program scope of all programs based upon the FY 2008 Budget Estimates, and identified 76 distinct programs. NASA generated disbursement totals for each program from its financial management system totaling $16.7 billion in disbursements. The aggregate disbursement total was validated against NASA's SF-133, *Report on Budget Execution and Budgetary Resources*. The number of in-scope programs was then reduced to 48 based on the materiality of disbursements.

(2) Develop Risk Matrix Elements

Once the scope of the risk assessment was finalized, NASA developed multiple templates to assist in the implementation of the assessment. These templates were designed to accurately capture and represent the relevant risk conditions facing NASA's programs, and measure the significance of those risk conditions for each program. The templates included risk conditions upon which NASA's programs would be evaluated and captured data such as risk assessment scores, disbursement values, and estimated error rates.

(3) Evaluate Risk Condition of In-scope Programs

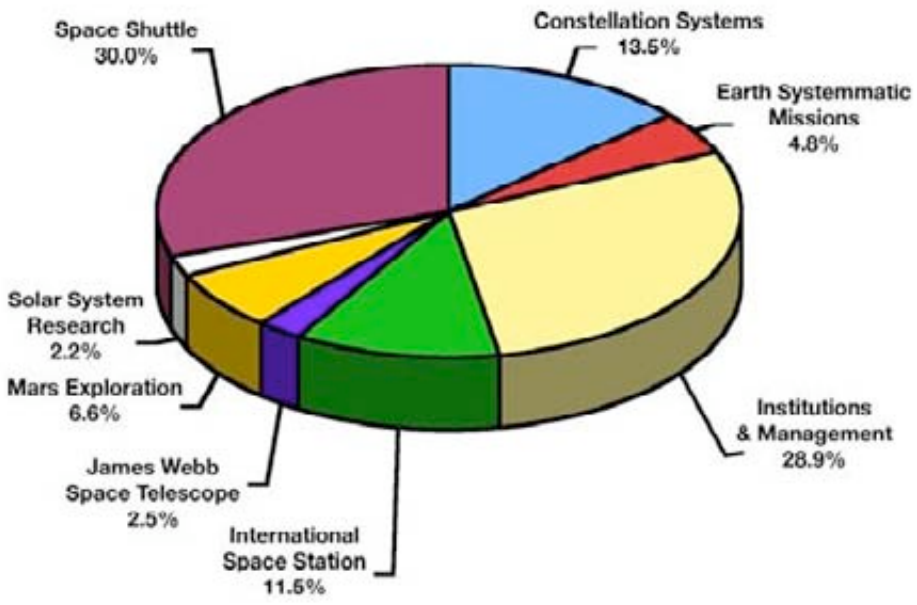
NASA evaluated the risk condition of in-scope programs including factors such as the control environment, internal and external monitoring, human capital risk, programmatic risk, and the nature of program payments. Additionally, NASA compiled the results of a Risk Assessment Questionnaire that was completed by Senior Management and Program Personnel.

(4) Populate Risk Matrix and Identify Highly Susceptible Programs

Based on the results of the interviews, NASA populated the risk matrix with qualitative data for each program (and risk condition). The qualitative data was used in conjunction with the scoring criteria to assign a risk score to each risk condition. NASA used the risk condition scores and weighting formulas to determine an overall risk score, and identify programs at high risk of being susceptible to significant improper payments. As a result the following programs were identified:

- Constellation Systems
- Earth Systemmatic Missions
- Institutions & Management
- International Space Station
- James Webb Space Telescope
- Mars Exploration
- Solar System Research
- Space Shuttle

FY 2008 Programs Susceptible to High Risk of Significant Improper Payments, as a Percentage of Total Susceptible Programs



Detailed Amounts by Program

FY 2008 Susceptible Programs	Total Program Payments FY 2007
Constellation Systems	$1,553,846,423
Earth Systemmatic Missions	550,432,021
Institutions & Management	3,311,333,916
International Space Station	1,321,949,617
James Webb Space Telescope	288,838,406
Mars Exploration	758,155,239
Solar System Research	252,358,071
Space Shuttle	3,445,562,697
Total	**$11,482,476,390**

II. Statistical Sampling

For each program identified as being susceptible to high risk of significant improper payments, NASA developed a statistically valid random sample of program payments in accordance with OMB guidelines and conducted tests of transactions in order to determine whether payments were proper or improper. NASA used a statistical random sampling method to yield an estimate with a 90 percent confidence level of plus or minus 2.5 percent for each program. A total number of 4,810 transactions were selected and investigated for the period of October 1, 2006, to September 30, 2007. The types of transactions included vendor payments, Government purchase card, and travel expenditures totaling $9.5 billion.

Description of Population and Sample Data

A random sample was selected for the period for each of the eight programs identified as susceptible to high risk of significant improper payments. The following table shows the number of transactions and dollar value by program for the payment population and sample:

Number of Transactions and Dollar Value by Program

Program	Transactions		$ Value	
	Population	Sample	Population	Sample
Constellation Systems	57,752	625	$1,317,010,445	$45,466,378
Earth Systemmatic Missions	16,480	823	496,262,975	70,048,474
Institutions & Management	245,442	515	2,111,398,388	13,058,154
International Space Station	25,638	717	1,171,250,237	86,053,919
James Webb Space Telescope	8,249	506	266,478,844	24,127,047
Mars Exploration	10,160	484	738,340,604	12,689,133
Solar System Research	13,607	724	140,833,185	8,686,561
Space Shuttle	55,942	416	3,252,693,691	11,271,335
Total	**433,270**	**4,810**	**$9,494,268,369**	**$271,401,001**

The sampling methodology and sample selection for each program is described below:

Constellation Systems

Sampling Methodology: A stratified sampling approach was applied to estimate improper payments for all payment types in the Constellation Systems Program.

Sample Selection: The population of payments included vendor payments, Government purchase card transactions, and travel expenditures in the defined testing period. A total of 625 items were selected and tested for the FY 2008 sample.

Earth Systemmatic Missions

Sampling Methodology: A stratified sampling approach was applied to estimate improper payments for all payment types in the Earth Systemmatic Missions Program.

Sample Selection: The population of payments included vendor payments, Government purchase card transactions, and travel expenditures in the defined testing period. A total of 823 items were selected and tested for the FY 2008 sample.

Institutions & Management

Sampling Methodology: A stratified sampling approach was applied to estimate improper payments for all payment types in the Institutions & Management Program.

Sample Selection: The population of payments included vendor payments, Government purchase card transactions, and travel expenditures in the defined testing period. A total of 515 items were selected and tested for the FY 2008 sample.

International Space Station

Sampling Methodology: A stratified sampling approach was applied to estimate improper payments for all payment types in the International Space Station Program.

Sample Selection: The population of payments included vendor payments, Government purchase card transactions, and travel expenditures in the defined testing period. A total of 717 items were selected and tested for the FY 2007 sample.

James Webb Space Telescope

Sampling Methodology: A stratified sampling approach was applied to estimate improper payments for all payment types in the James Webb Space Telescope Program.

Sample Selection: The population of payments included vendor payments, Government purchase card transactions, and travel expenditures in the defined testing period. A total of 506 items were selected and tested for the FY 2008 sample.

Mars Exploration

Sampling Methodology: A stratified sampling approach was applied to estimate improper payments for all payment types in the Mars Exploration Program.

Sample Selection: The population of payments included vendor payments, Government purchase card transactions, and travel expenditures in the defined testing period. A total of 484 items were selected and tested for the FY 2008 sample.

Solar System Research

Sampling Methodology: A stratified sampling approach was applied to estimate improper payments for all payment types in the Solar System Research Program.

Sample Selection: The population of payments included vendor payments, Government purchase card transactions, and travel expenditures in the defined testing period. A total of 724 items were selected and tested for the FY 2008 sample.

Space Shuttle

Sampling Methodology: A stratified sampling approach was applied to estimate improper payments for all payment types in the Space Shuttle Program.

Sample Selection: The population of payments included vendor payments, Government purchase card transactions, and travel expenditures in the defined testing period. A total of 416 items were selected and tested for the FY 2008 sample.

III. Conclusion

Based on the results of testing, NASA identified 67 improper payments for a gross total of $4,296. Sixty-one payments were identified as underpayments totaling $1,841 and six payments were identified as overpayments totaling $2,455. An extrapolation of the 67 payments over the entire universe resulted in $11,628,187 of estimated improper payments during the period (October 1, 2006–September 30, 2007). These amounts are not considered significant as defined by OMB A-123, Appendix C and therefore NASA is not required to submit a written corrective action plan; however, NASA will implement corrective actions in FY 2009 to further reduce its exposure to improper payments.

The following table shows the total payments by population, sample amount, and annual estimate of improper payments by program.

FY 2007 Total Disbursements by Program

Program	$ Value		FY 2008 Annual Estimate of Improper Payments	FY 2008 Percentage Estimate of Improper Payments
	Population	Sample		
Constellation Systems	$1,317,010,445	$45,466,378	$0	0.000%
Earth Systematic Missions	496,262,975	70,048,474	71,333	0.014%
Institutions & Management	2,111,398,388	13,058,154	80,946	0.004%
International Space Station	1,171,250,237	86,053,919	19,846	0.002%
James Webb Space Telescope	266,478,844	24,127,047	1,732,483	0.650%
Mars Exploration	738,340,604	12,689,133	76,317	0.010%
Solar System Research	140,833,185	8,686,561	29,109	0.021%
Space Shuttle	3,252,693,691	11,271,335	9,618,153	0.296%
Total	**$9,494,268,369**	**$271,401,001**	**$11,628,187**	**0.122%**

NASA identified the following types of improper payments:

- NASA noted 61 instances where a single invoice was paid after the due date as defined by 5 CFR 1315 – Prompt Payment Final Rule in the Code of Federal Regulations. As a result, an interest penalty should have been applied to the vendor payment as defined by the Prompt Payment Final Rule. The Prompt Payment Final Rule requires Executive departments and agencies to pay commercial obligations within certain time periods and to pay interest penalties when payments are late. This occurred in the Earth Systemmatic Missions, Institutions & Management, International Space Station, James Webb Space Telescope, Mars Exploration, and Solar System Research programs.
- NASA noted three instances where a single late payment included an incorrect interest penalty resulting in an overpayment. This occurred in the James Webb Space Telescope program.
- NASA noted three instances where a single invoice was paid for services incurred or goods received after the contractual period of performance had expired. This occurred in the James Webb Space Telescope and Space Shuttle programs.

NASA will continue efforts to ensure current policies and procedures for processing invoices are properly implemented. In FY 2008, NASA revised financial management requirements to ensure that the guidance adequately reflects the proper guidelines for compliance with the *Prompt Payment Act*. NASA also communicated these procedures to staff. In addition, in FY 2009 NASA will conduct periodic assessments of disbursement activities to ensure compliance with guidelines.

Recovery Audit

In accordance with the requirements of section 831 of the *Defense Authorization Act* of FY 2002, NASA performs recovery audits as part of its overall program of effective internal control over contract payments. In FY 2008 NASA performed a recovery audit focused on its FY 2006 disbursements.

In accordance with OMB guidance, agencies may determine to exclude classes of contracts and contract payments from recovery audit activities if the agency head determines that the recovery audits are inappropriate or not a cost-effective method for identifying and recovering improper payments. Consequently NASA does not include cost-type contracts in its assessment for recovery audits.

NASA engaged an industry leader in recovery auditing under a contingency contract, beginning with FY 2006 disbursements. The following table shows the FY 2006 recovery audit results. NASA expects to perform the FY 2007 and FY 2008 recovery audits during FY 2009 to ensure annual reporting requirements are up to date.

Agency Component	Amount Subject to Review for FY 2006 Reporting	Actual Amount Reviewed and Reported FY 2006	Amounts Identified for Recovery FY 2006	Amounts Recovered FY 2006	Amounts Identified for Recovery (Prior FYs)	Amounts Recovered (Prior FYs)	Cumulative Amounts Identified for Recovery	Cumulative Amounts Recovered
NASA	$4,533,362,600	$4,533,362,600	$9,044	$6,800	$198,794	$197,215	$207,8380	$204,015

The Agency has taken steps through the Improper Payment reviews and recovery audits to continue holding agency managers accountable for reducing and recovering improper payments. In FY 2008, NASA prepared Recovery Audit guidance with clear roles and responsibilities for management personnel as it pertains to recovering improper payments. The Recovery Audit process is monitored by headquarters to ensure compliance with these new guidelines. In addition, the collection function is now centralized at the NASA Shared Services Center to ensure prompt recovery of overpayments.

NASA has the infrastructure and information technology in place to reduce improper payments. In FY 2008, NASA consolidated the payment disbursement function at the NASA Shared Services Center. There are no statutory or regulatory barriers limiting NASA's ability to reduce improper payments.

FY 2008 Inspector General Act Amendments Report

Background

The *Inspector General Act* of 1978 (P. L. 95-452) requires that the head of each Federal agency make a final management decision 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 attain final management action on each final management decision within 12 months after issuance of an audit report.

The *Inspector General Act Amendments* of 1988 (P.L. 100-504) added a requirement that the head of each Federal agency report on the status of final management decisions and final management action taken on OIG audit recommendations, as well as on the monetary findings identified in those audit reports. Specifically, agency heads are required to disclose:

- The number of OIG audit recommendation for which a final management decision has not been made within six months after the date of a final audit report;
- The number of OIG audit recommendations for which final management action has not been achieved within 12 months after the date of a final report, and;
- The dollar amount of monetary findings identified (i.e., disallowed costs and funds to be put to better use [FPTBU]).

The following definitions are provided to enhance the readability of NASA's FY 2008 Inspector General Act Amendments Report:

A ***Final Management Decision*** **(**also referred to as *resolution***)** occurs when the Agency agrees to implement an audit recommendation made by the OIG (or a contractor performing audit services for the OIG). [Alternatively, a final management decision is achieved when the OIG concurs on an alternative course of corrective action proposed by management in response to an OIG audit recommendation].

Final Management Action is the point in time when corrective action, taken by management in conjunction with a final management decision, is completed.

Corrective Action consists of remediation efforts on the part of management which are intended to mitigate an audit finding.

Disallowed Costs are those questioned costs associated with an audit finding that have been determined should not be charged to the Government.

Funds to be Put to Better Use **(FPTBU)** are funds that could be used more efficiently if management implemented recommendations including: Reductions in outlays; De-obligation of funds; or Costs not incurred by implementing recommended improvements related to operations of the agency, a contractor, or a grantee.

NASA's Audit Follow-up Program

NASA management is committed to ensuring the timely resolution of audit recommendations, coupled with the timely implementation and completion of related corrective actions. NASA management also believes that audit follow-up is essential to improving the efficiency and effectiveness of NASA programs, projects, and operations. In this regard, NASA has implemented a comprehensive program of audit liaison, resolution, and follow-up (ALRFU) intended to ensure that OIG audit recommendations are resolved and corrective action is implemented and completed in a timely and effective manner.

NASA's Office of Internal Controls and Management Systems (OICMS) is responsible for policy formulation, oversight, and functional leadership of NASA's ALRFU program. OICMS operates in conjunction with a network of Audit Liaison Representatives (ALRs) imbedded within each of NASA's Mission Directorates, Mission Support Offices, Administrator's staff offices, and field Centers. This virtual team collectively provides the organizational structure to support NASA's ALRFU program.

Frequently, the corrective action associated with a final management decision spans several reporting periods. This may be due to the complexity of the planned corrective action (which often times consists of the design, implementation, and testing of related systems or sub-systems); or the development, concurrence, and review process associated with NASA

policy and/or procedural requirements. In an effort to help manage corrective action that spans multiple reporting periods NASA management, in conjunction with the OIG, has developed a process whereby planned corrective action dates are periodically reviewed and adjusted to better reflect the anticipated final management action dates.

In FY 2006, OICMS partnered with the OIG's Special Projects and Quality Assurance Directorate to conduct periodic assessments of the efficiency and effectiveness of NASA's audit follow-up program, based on requirements delineated in Office of Management and Budget Circular A-50, "*Audit Follow-up*," dated September 29, 1982. Both the OIG and OICMS conducted assessments during FY 2006, followed by an OICMS assessment in FY 2007. OICMS is currently planning an assessment for FY 2009.

FY 2008 Audit Follow-up Results

1. Final Management Decision Pending—More than Six Months After Report Issuance

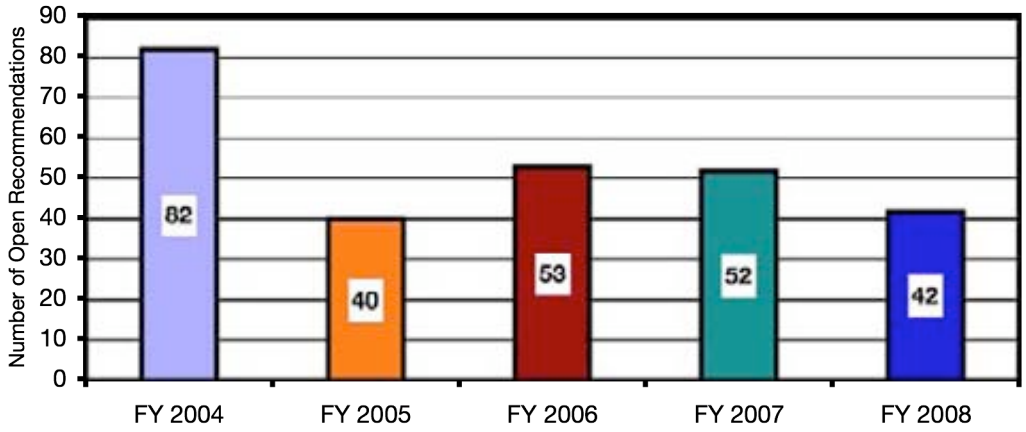
For the fiscal year ended September 30, 2008, there were no OIG audit recommendations pending a final management decision more than six months after the issuance of the associated audit reports.

2. Final Management Action Pending—One Year or More After Report Issuance

As of September 30, 2008, there were 17 OIG audit reports containing 42 recommendations on which a final management decision had been made but final management action was still pending, one year or more after the issuance of the respective reports (see Table 1).

For comparative purposes, as of September 30, 2007, there were 17 audit reports containing 52 recommendations on which a final management decision had been made, but final management action was still pending one year or more after the issuance of the respective reports. For the five year period ended September 30, 2008, the number of OIG audit recommendations pending final management action one year or more after issuance of a final audit report ranged between 40 and 82. With the exception of FY 2004, the number of these audit recommendations has remained relatively static and have ranged between 40 and 53 (see Figure 1).

Figure 1: OIG Audit Recommendation Open More Than One Year



The 82 audit recommendations pending final management action at the end of FY 2004 included 51 recommendations (62 percent) issued by the OIG in conjunction with prior years' audits of NASA's financial statements and related financial management system. The impact of financial statement and related audit recommendations in FY 2008 has been substantially reduced to 10 (23 percent) of the 42 OIG audit recommendations pending final management action one or more years after the issuance of a final audit report at the end of FY 2008.

Table 1: Summary of OIG Audit Reports Pending Final Management Action
One Year or More After Issuance of a Final Report
(As of September 30, 2008)

Report No. Report Date	Report Title	No. of Recommendations	
		Open	Closed
IGFS01 01-28-04	*Audit of NASA's Fiscal Year 2003 Financial Statements*	3	15
IG-04-025 09-07-2004	*NASA's Implementation of the Mission Critical Space System Personnel Reliability Program*	1	5
IG-05-016 05-12-2005	*Audit of NASA's Information Technology Vulnerability Assessment Process*	1	3
IG-05-025 09-15-2005	*NASA's Performance Measure Data Under the Federal Information Security Management Act*	1	4
IG-06-007 03-17-2006	*NASA's Implementation of Patch Management Software Is Incomplete*	2	0
IG-06-016 08-29-2006	*NASA's Implementation of the National Incident Management System*	1	5
IG-07-004 11-09-2006	*Audit of the National Aeronautics and Space Administration's Fiscal Year 2006 Financial Statements (Enclosure 2: Report on Internal Control)*	6	13
IG-07-003 11-21-2006	*Governance of the SAP Version Update Project Needs Improvement*	3	3
IG-07-007 11-29-2006	*Information Technology Findings and Recommendations for the Fiscal Year Ended September 30, 2006*	1	10
IG-07-005 01-29-2007	*NASA's Plan for Space Shuttle Transition Could Be Improved by Following Project Management Guidelines*	2	2
ML-07-005 03-13-2007	*Final Memorandum on Follow-Up Review of the Management of the Headquarters Exchange*	2	5
IG-07-014 06-19-2007	*Controls over the Detection, Response, and Reporting of Network Security Incidents Needed Improvement at the Four NASA Centers Reviewed*	4	4
IG-07-019 07-18-2007	*NASA Could Improve Controls and Lower the Costs of the Intergovernmental Personnel Act Mobility Program*	6	2
IG-07-022 07-20-2007	*Internal Controls over NASA's Transit Subsidy Program at Headquarters and Goddard Space Flight Center Needed Improvement*	2	2
IG-07-025 08-14-2007	*Final Memorandum on Audit of NASA's Compliance with Federal Internal Control Reporting Requirements*	5	3
IG-07-024 08-28-2007	*Final Memorandum on NASA's Implementation of the Privacy Provisions of the Electronic Government Act*	1	1
IG-07-029 09-18-2007	*Final Memorandum on Audit of NASA Education and Training Grants (Redacted)*	1	2
	Totals	**42**	**79**

3. Audit Reports with Disallowed Costs and/or Funds to Be Put to Better Use

As a result of a recommendation in a report entitled, "*Final Memorandum on Audit of NASA's Global Precipitation Measurement Project*," (Report No, IG-08-016) dated March 31, 2008, the OIG identified $300,000 of Funds to Be Put to Better Use in conjunction with a cost assessment relating to the Global Precipitation Measurement project (see Table 2).

Table 2: Summary of Disallowed Costs and Funds to Be Put to Better Use (For the Year Ended September 30, 2008)

Category	Disallowed Costs		Funds to Be Put to Better Use	
	Number of Reports	Dollars	Number of Reports	Dollars
Reports pending final management action at the beginning of the reporting period	—	—	0	—
Reports on which management decisions were made during the reporting period	—	—	1	$300,000
Total reports pending final action during the reporting period	—	—	1	$300,000
Reports on which final action was taken during the reporting period	—	—	0	—
Audit reports pending final action at the end of the reporting period	—	—	1	$300,000

Summary of Financial Statement Audit and Management Assurances

The following tables summarize the Agency's FY 2008 material weaknesses as identified by the Financial Statement Auditor and Management. Table 1 summarizes the Financial Statement Audit material weaknesses. Table 2 summarizes the material weaknesses identified by NASA Management in the Statement of Assurance included in the Management Assurance section.

Table 1: Summary of Financial Statement Audit

Audit Opinion	Disclaimer
Restatement	No

Material Weaknesses	Beginning Balance	New	Resolved	Consolidated	Ending Balance
Controls Over Property, Plant and Equipment	1	0	0	0	1
Financial Systems, Analyses and Oversight	1	0	0	0	1
Total Material Weaknesses	**2**	**0**	**0**	**0**	**2**

Table 2: Summary of Management Assurances

Effectiveness of Internal Control Over Financial Reporting (FMFIA 2)

Statement of Assurance	Qualified

Material Weaknesses	Beginning Balance	New	Resolved	Consolidated	Reassessed	Ending Balance
Asset Management	1	0	0	0	0	1
Financial Systems, Analyses, and Oversight	1	0	0	0	0	1
Total Material Weaknesses	**2**	**0**	**0**	**0**	**0**	**2**

Effectiveness of Internal Control Over Operations (FMFIA 2)

Statement of Assurance	Unqualified

Material Weaknesses	Beginning Balance	New	Resolved	Consolidated	Reassessed	Ending Balance
Information Technology Security	1	0	1	0	0	0
Total Material Weaknesses	**1**	**0**	**1**	**0**	**0**	**0**

Conformance With Financial Management System Requirements (FMFIA 4)

Statement of Assurance	Systems do not conform to financial management system requirements.

Material Weaknesses	Beginning Balance	New	Resolved	Consolidated	Reassessed	Ending Balance
Information Technology Security	1	0	1	0	0	0
Financial Systems, Analyses, and Oversight	1	0	0	0	0	1
Total Material Weaknesses	**2**	**0**	**1**	**0**	**0**	**1**

Compliance With Federal Financial Management Improvement Act (FFMIA)

	Agency	Auditor
Overall Substantial Compliance	No	No
1. System Requirements	No	
2. Accounting Standards	No	
3. USSGL at Transaction Level	Yes	

FY 2007 Performance Improvement Plan Update

NASA reviews program and project deficiencies as reported in the annual Performance and Accountability Report and tracks the progress of remedial actions taken to correct these shortcomings. The following table presents the FY 2007 multi-year Outcomes and APGs that were rated Yellow or Red, the plans and schedules to correct them presented in the FY 2007 Performance Improvement Plan, and the results of FY 2008 follow-up actions.

Description	Rating	Why the Measure Was Not Met	Plans for Achieving the Measure in FY 2008
Exploration Systems			
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 capacity to support human exploration missions.	Yellow	Using recommendations from the Exploration Systems Architecture Study (ESAS), the Constellation Systems Program initially pursued the CEV, CLV, CaLV, and Earth Departure Stage points of departure to enable crew transportation to the ISS and future missions to the Moon and Mars. Following the tenets of rigorous systems engineering, NASA conducted trade studies, in tandem with independent cost estimating and acquisition planning, during the early formulation phases of the CEV, CLV, and CaLV to validate ESAS findings against assumptions and known risks, and to revalidate resource and acquisition strategies in relation to NASA's priorities. The primary objective of these studies was to recalibrate decision-making assumptions to address the priority placed on Moon return missions, rather than on minimizing the human spaceflight gap and on the more distant Mars exploration milestone. In January 2006, the Agency streamlined its approach to launch vehicles hardware development based on the results of systems engineering trade studies.	ESMD completed a critical assessment of the ESAS recommendations and incorporated changes intended to reduce overall life cycle costs and integrated risk for human lunar landings while meeting the NASA's Mission and Vision. NASA continues to perform trades in support of the requirements development process, which will culminate in a series of Systems Requirements Reviews for the CEV, CLV, and supporting ground elements. NASA's FY 2008 Budget Estimates notified Congress that the commitment date for achieving Outcome 4.1 now is no later than 2015.
FY 2008 Follow-up: Outcome 4.1 for FY09 now states "no later than 2015". The Constellation Program has moved from program planning into development of the major program elements. Development activities completed since FY 2007 include the completion of all project System Requirement Reviews (SRRs), Systems Definition Reviews (SDRs) and Key Decision Points (KDP) B except the Extravehicular Activity (EVA) project KDP B. The SDRs and KDP-Bs gave approval for projects to proceed towards Preliminary Design Review. The EVA project is well underway to complete KDP-B in early FY 2009. Contract activities within the Constellation Program are all underway for the initial capability. The Constellation Program also has begun hardware fabrication and testing. Orion completed fabrication of the Crew Module for the Pad Abort-1 test, the first test in a series to characterize the Launch Abort System. Parachute tests, wind tunnel tests, and engine component tests have also been conducted.			
7CS1 (Outcome 4.1)			
Complete the Systems Design Review for the Constellation Program.	Yellow	This metric was established in 2005 at a time when the program was still in early formulation. Since then, ESMD has changed architecture and gained a better understanding of requirements, which resulted in a shift to the overall program schedule that also flowed down to the projects. The Orion Project refined its schedule to reflect the Constellation Systems Program architecture change and shifted the Preliminary Design Review (PDR) to align with the new program milestones.	The Constellation Systems Program continues to perform key system- and element-level trade studies and analyses to validate the design concepts against the requirements and/or determine whether changes to the baseline design concepts are warranted. With successful completion of its Systems Requirements Review (SRR), the program is progressing steadily towards the Systems Definition Review (SDR) in 2008, with individual project reviews (Orion, Ares I, Ground Operations, Mission Operations, and EVA Systems) occurring prior to the program SDR.
FY 2008 Follow-up: The Constellation Program successfully completed the Systems Definition Review (SDR) in June 2008 with individual project reviews (Orion, Ares I, Ground Operations, Mission Operations, and EVA Systems) occurring prior to the program SDR.			

Description	Rating	Why the Measure Was Not Met	Plans for Achieving the Measure in FY 2008
7CS2 (Outcome 4.1)			
Complete the Preliminary Design Review for the Crew Exploration Vehicle (CEV).	Yellow	This metric was established in 2005 at a time when the program was still in early formulation. Since then, ESMD has changed architecture and gained a better understanding of requirements, which resulted in a shift to the overall program schedule that also flowed down to the projects. The Orion Project refined its schedule to reflect the Constellation Systems Program architecture change and shifted the PDR to align with the new program milestones.	NASA and the prime contractor, Lockheed Martin, developed a Point of Departure (POD) architecture that combined the best features of the contractor and the NASA design concepts. This POD architecture supported the Orion SRR. The SRR, completed in March 2007, was held to ensure that: requirements had been identified; those requirements are consistent with Constellation Systems Program Requirements; the Constellation Systems Program Requirements have been properly translated into Orion systems and design requirements; and trade-offs between conflicting requirements have been performed and properly resolved. The Orion team concluded the SDR on August 31, 2007. Now the Orion team is assessing the design concept to ensure that the design configuration that came out of the SDR process provides a feasible design with respect to available resources including mass, power and cost. This configuration will be the starting point for the Design Analysis Cycle that leads to the PDR scheduled in 2008.
FY 2008 Follow-up: ESMD completed the mitigation plan. However, the PDR will not be held in 2008 because, upon completion of the Post-SDR Design Analysis Cycle (DAC) as listed in the above plan, the Orion team decided it needed additional analysis and trades to ensure that the preliminary design was mature enough for PDR. The team is still performing trades on specific architecture solutions to ensure that mass and other key performance requirements are met. Orion will hold a mini DAC and the PDR will be held in 2009.			
7CS3 (Outcome 4.1)			
Complete the Preliminary Design for the Crew Launch Vehicle (CLV) First Stage.	Yellow	This metric was established in 2005 at a time when the program was still in early formulation. Since then, ESMD has changed architecture and gained a better understanding of requirements, which resulted in a shift to the overall program schedule that also flowed down to the projects. The Orion Project refined its schedule to reflect the Constellation Systems Program architecture change and shifted the PDR to align with the new program milestones.	The Ares I SRR, completed in December 2006, confirmed that the Ares I system requirements were complete, validated, and responsive to mission requirements. The Ares I project proceeded to SDR in September 2007. The SDR board convened on October 30, 2007, and provided approval for the project to proceed to PDR, at which point the project will initiate the element preliminary design reviews.
FY 2008 Follow-up: The Ares I project PDR was completed in September 2008. Review results are progressing through a series on agency Program Management Council reviews, culminating with the Key Decision Point C review at the Agency Program Management Council.			
7CS8 (Outcome 5.2)			
Complete assessment of at least two contractor deliverables that will support the development of vehicles that can provide commercial cargo or crew transport services.	Yellow	In NASA's assessment, while significant progress was made in FY 2007 toward achieving the long-term goals of the program, not all planned work content was provided. Hence NASA only partially achieved the APG. This is an expected potential outcome for investments in this risk area, and the reason for funding more than one contractor. NASA expects that the long-term goals of the program will be met.	Since the program made significant progress toward the long-term goals—and the results of the FY 2007 specific work still support this—NASA has no plans to meet this specific APG met in the future.
FY 2008 Follow-up: This APG was created pre-Commercial Orbital Transportation Services (COTS). The ESMD COTS Program has the intent (to provide commercial cargo or crew transportation services) of this APG captured in its 2008 and subsequent APGs.			

Description	Rating	Why the Measure Was Not Met	Plans for Achieving the Measure in FY 2008
7HSRT7 (Efficiency Measure)			
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	HSRT completed the Radiation NRA within 173 days. The implementation of this NRA involved two organizations, NASA and the National Space Biomedical Research Institute. Since this was the first time such a joint Radiation NRA was issued, the required coordination between these organizations resulted in approximately an extra month of time. The delay in the Radiation NRA completion did not impact distribution of research funds; this occurred in October 2007 as planned.	Both organizations plan to eliminate some unanticipated schedule conflicts, streamlining the completion process for future Radiation NRAs.
FY 2008 Follow-up: Research management eliminated the schedule conflicts and met the Efficiency Measure for the latest radiation research NRA.			
Aeronautics Research			
7AT8 (Efficiency Measure)			
Deliver at least 90% of scheduled operating hours for all operations and research facilities.	Yellow	A number of unexpected breakdowns and construction project delays occurred at several facilities resulting in the delivery of 73 percent of scheduled operating hours for all Aeronautics Test Program (ATP) facilities.	ATP will continue to invest in test facility maintenance projects with the goal of improving facility reliability and availability. However, due to the age and current condition of the facilities, system failures and resulting unplanned downtime have exceeded ARMD's best estimates. To mitigate this in FY 2008, ATP will sponsor a comprehensive assessment of facilities and associated Center infrastructure and develop a long-range investment strategy.
FY 2008 Follow-up: In FY 2008, ATP exceeded its goal of substantially reducing the Agency's deferred maintenance liability for ground test facilities through an ambitious facility maintenance and upgrade project. ATP also completed a comprehensive, independent facility condition assessment of its ground test facilities and related infrastructure in FY 2008. A long-range investment strategy is in development. ATP awarded a contract to the RAND corporation in the fourth quarter of FY 2008 for this effort and the scheduled completion is during the second quarter of FY 2009.			
Science			
7ESS6 (Outcome 3A.3)			
Complete Orbiting Carbon Observatory (OCO) Assembly, Test and Launch Operations (ATLO) Readiness Review.	Yellow	Technical and Schedule performance issues with the OCO instrument subcontractor resulted in a four-month launch delay. Consequently, SMD adjusted all major milestones, including the ATLO Readiness Review, to accommodate the new launch date.	As part of the rebaselined schedule, SMD plans to conduct the OCO ATLO Readiness Review in January 2008. SMD continues to monitor all its development projects to maintain cost and schedule baselines.
FY 2008 Follow-up: SMD completed the OCO ATLO Readiness Review in March 2008.			

Description	Rating	Why the Measure Was Not Met	Plans for Achieving the Measure in FY 2008
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.	Yellow	Performance toward this Outcome continues to be a concern due to uncertainties in climate data continuity and delays and technical issues related to the NPOESS Preparatory Project (NPP) mission. Although the NASA-developed NPP spacecraft and the NASA-supplied Advanced Technology Microwave Sounder (ATMS) instrument have been successfully delivered and tested and the ATMS is integrated onto the NPP spacecraft, significant technical and schedule problems have caused delays with the development and delivery of the NPOESS-developed Visible/Infrared Imager/Radiometer Suite (VIIRS) instrument. The performance of the instrument will not meet all of NASA's NPP Level 1 requirements and, therefore, will impact key climate research measurements of ocean color and atmospheric aerosols. Contractor performance also poses risks to both the NPP and Glory missions. Performance issues have been causing cost and schedule overruns, which impact not only the timely implementation of the systematic Earth Observation missions, but the overall success of the flight program.	In order to improve contractor performance and limit further cost and schedule overruns, NASA implemented management changes on the Glory mission. Management changes also were approved by the Tri-Agency (NASA, NOAA, and Department of Defense) Executive Committee and Implemented by the Integrated Program Office (IPO) on NPOESS. Program funding ensures NASA support to the IPO technical management personnel, funding for the competitively selected NPP science team, and the continued NPP project requirements. NASA continues to work with partner agencies to utilize the assessment information developed by the NPP project and science team in developing a joint mitigation strategy and implementation plan.
FY 2008 Follow-up: Progress toward this Outcome continues to be a concern due to uncertainties in climate data continuity and delays and technical issues related to the NPP mission. In particular, the NPOESS-developed VIIRS instrument continues to present significant development challenges and its performance is already known to not meet all of NASA's NPP Level One Requirements and, therefore, will impact key climate research measurements of ocean color and atmospheric aerosols. VIIRS performance issues have been causing cost and schedule overruns, which impact not only the timely implementation of the systematic Earth observation missions, but the overall success of the flight program. In addition to previous contractor management changes approved by the Tri-Agency (NASA, NOAA, Department of Defense) Executive Committee and implemented by the Integrated Program Office (IPO) on NPOESS, NASA is supplying key quality assurance personnel to support IPO technical management personnel in accelerating the completion of the VIIRS instrument. NASA also is undertaking a comprehensive analysis of science community requirements unlikely to be met by VIIRS as an initial step in devising a mitigation strategy.			
7ESS8 (Outcome 3A.5)			
Complete Glory mission Pre-Ship Review.	Yellow	SMD did not complete the Glory mission Pre-Ship Review. The contractor, Raytheon Space and Airborne Systems, experienced delays in developing the Aerosol Polarimetry Sensor (APS) instrument, resulting in a decision to move the instrument work to a different development facility. This caused an estimated six-month delay to the APS delivery. There are no significant technical issues with the development of this instrument.	SMD is revising project plans and scope to optimize the schedule and manpower for the late delivery of the APS. The Pre-Ship Review is scheduled for January 2009. SMD continues to monitor all its development projects to maintain cost and schedule baselines.
FY 2008 Follow-up: The Glory mission Pre-Ship Review is currently scheduled for spring 2009 to accommodate the summer 2009 launch date.			

Description	Rating	Why the Measure Was Not Met	Plans for Achieving the Measure in FY 2008
7ESS24 (Efficiency Measure)			
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.	Red	Earth-Sun System research grant selection notifications were significantly delayed in FY 2007 as a result of several factors that resulted in an increase rather than a decrease to processing times. The 15-percent reduction in the Research and Analysis budget in FY 2006, maintained in FY 2007 under the year-long continuing resolution, delayed selection decisions. Additionally, due to several large triennial programs being competed in FY 2007 and the increasing pressure for funding, the number of selection notifications (599) for the Earth-Sun System Theme was 61-percent greater than in FY 2006 (373).	SMD is implementing a number of measures to reduce processing times and expects to make significant progress, These measures include finding greater efficiencies in the manner in which panel reviews are constructed, reassessing the steps taken to conduct the proposal review process, and instituting job sharing to afford greater support and back-up contingencies for program officers. Furthermore, it is SMD's goal to adjust the timing of review panels to achieve greater efficiency. However, it should be noted that processing times for Earth Science will likely show an increase every third or fourth year, when the program conducts several large reviews at the start of a cycle. Although staggering the scheduling of these reviews would speed processing times, doing so would have programmatic impacts and will have to be carefully considered.
FY 2008 Follow-up: SMD and, in particular, the Earth Science Program demonstrated significant improvement in grant processing times during FY 2008. SMD has taken a number of steps to achieve greater efficiency, including the development of a draft policy document addressing best practices for the peer review process. The policy will be finalized in FY 2009 and made available to the public. To further streamline the process, SMD has also developed a database of potential peer reviewers.			
7ESS14 (Outcomes 3B.1, 3B.2, and 3B.3)			
Deliver Solar Dynamics Observatory (SDO) instruments to spacecraft for integration.	Yellow	The delivery of two of the three SDO instruments was delayed due to unanticipated technical difficulties in the data interfaces between the Helioseismic and Magnetic Imager (HMI) and the Atmospheric Imaging Assembly (AIA) and the spacecraft's command and data handling system. Both instruments use the new technology of 4000 x 4000 charge-coupled detectors to take high-resolution video for HMI and images for AIA of the Sun. The difficulties are attributed to both the charge coupled detectors and new, untested electronics technology and software that would allow SDO to transfer data at 130 Megabits per second with very high accuracy.	The HMI instrument was delivered in November 2007. The AIA instruments were delivered in December 2007. SMD continues to monitor all its development projects to maintain cost and schedule baselines.
FY 2008 Follow-up: Earth Science achieved this APG as reported in the FY 2007 Annual Performance Report.			
7ESS15 (Outcomes 3B.1 and 3B.2)			
Complete Magnetospheric MultiScale (MMS) instrument suite Preliminary Design Review (PDR).	Red	NASA replanned the MMS mission to resolve the discrepancy between mission requirements and the available budget. Progress on mission milestones was delayed during the replanned schedule, but this replanning allowed the mission to go forward intact, without major performance degradation.	NASA approved MMS for transition to Phase B in November 2007. The MMS instrument suite PDR is scheduled for completion in FY 2009.
FY 2008 Follow-up: As stated above, the MMS instrument suite PDR is scheduled for completion in FY 2009.			
7ESS21 (Efficiency Measure)			
Complete all development projects within 110% of the cost and schedule baseline.	Yellow	The THEMIS mission exceeded its schedule baseline by 13 percent. The launch vehicle provider requested a four-month launch delay to resolve a second-stage oxidizer tank anomaly on the Delta launch vehicle.	The THEMIS mission launched in February 2007. SMD continues to monitor all its development projects to maintain cost and schedule baselines. Cost control is now a significant central tenet of SMD's management and future missions are being held to stricter standards than in the recent past.
FY 2008 Follow-up: Earth Science achieved this APG as reported in the FY 2007 Annual Performance Report.			

Description	Rating	Why the Measure Was Not Met	Plans for Achieving the Measure in FY 2008
7SSE10 (Efficiency Measures)			
Complete all development projects with 110% of the cost and schedule baseline.	Red	NASA successfully launched the Phoenix and Dawn missions during FY 2007. The Phoenix mission was completed on schedule and exceeded its cost baseline by only three percent. However, the Dawn mission exceeded its schedule baseline by 54 percent and its cost baseline by 27 percent. Unresolved technical and schedule issues driven by delayed hardware deliveries compromised the 2006 launch opportunity for the Dawn mission, leading NASA to cancel the mission in December 2005. After extensive reviews and replanning, NASA restarted the mission in March 2006, with a new launch date of June 2007. Launch vehicle and telemetry support issues caused NASA to delay the launch from June to September 2007.	The Dawn mission was successfully launched on September 26, 2007, completing the work affecting this measure in FY 2007. SMD continues to monitor all its development projects to maintain cost and schedule baselines. Cost control is now a central tenet of SMD's management, and future missions are being held to stricter standards than in the recent past. When SMD reviews projects at key decision points, descope options are given primary consideration in addressing any cost growth. SMD took such action recently on the Kepler project, for which a cost increase was mitigated by shortening the mission duration by six months and by holding the contractor's fee as reserve on the project.
FY 2008 Follow-up: Earth Science achieved this APG as reported in the FY 2007 Annual Performance Report.			
7SSE13 (Efficiency Measure)			
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.	Red	Due to increasing pressure for funding, the number of selection notifications (445) was 35-percent greater than in FY 2006 (330). Rather than showing progress toward the FY 2007 goal of selecting proposals within 259 days of the proposal due date, the Planetary Science Theme's processing times increased to 314 days.	SMD is implementing a number of measures to reduce processing times and expects to make significant progress. These measures include finding greater efficiencies in the manner in which panel reviews are constructed, reassessing the steps taken to conduct the proposal review process, and instituting job-sharing to afford greater support and back-up contingencies for program officers. Furthermore, it is SMD's goal to adjust the timing of review panels to achieve greater efficiency.
FY 2008 Follow-up: The Earth Science Program and SMD as a whole demonstrated significant improvement in grant processing times during FY 2008. SMD has taken a number of steps to achieve greater efficiency, including the development of a draft policy document addressing best practices for the peer review process. The policy will be finalized in FY 2009 and made available to the public. To further streamline the process, SMD also has developed a database of potential peer reviewers.			
Outcome 3D.4			
Progress in creating a census of extra-solar planets and measuring their properties.	Yellow	The Astrophysics Theme's performance towards this Outcome continues to be "Yellow" due primarily to the inability to ramp up flight developments in previously planned planet-finding and characterizing missions. Science progress is good, but the scale of investments needed to start new missions, coupled with the Theme's decreasing overall budget and other significant commitments, resulted in previously envisioned missions slipping beyond the budget horizon.	The Astrophysics Theme solicited mission concept studies for planet-finding and characterizing missions that would be more affordable. The proposals, which were due in November 2007, will be evaluated in FY 2008.
FY 2008 Follow-up: In FY 2008, NASA issued an open competition for large and medium class mission concept studies, including exo-planet missions. Once the proposals were evaluated, seven exo-planet mission concept studies were selected and funded. The selected mission concept studies will be part of the missions reviewed by the upcoming National Research Council's Astrophysics and Astronomy Decadal review that will start in 2009. The recommendations and rankings of the decadal report will then help form the focus of the Astrophysics Program's budget strategies in the coming decade, including the priority of exo-planet space missions.			
7UNIV2 (Outcome 3D.1)			
Complete Gamma-ray Large Area Space Telescope (GLAST) Operations Readiness Review (ORR).	Yellow	NASA delayed the GLAST launch due to continued slips in completing the Command and Data Handling subsystem, spacecraft testing schedule conflicts with Department of Defense projects, and spacecraft contractor performance issues.	The GLAST Operational Readiness Review and launch are scheduled for mid-2008. SMD continues to monitor all its development projects to maintain cost and schedule baselines.
FY 2008 Follow-up: NASA completed GLAST (now called the Fermi Gamma-ray Space Telescope) ORR on April 10, 2008.			

Description	Rating	Why the Measure Was Not Met	Plans for Achieving the Measure in FY 2008
7UNIV9 (Efficiency Measure)			
Complete all development projects within 110% of the cost and schedule baseline.	Red	The GLAST mission exceeded 110 percent of the cost and schedule baselines. NASA delayed the GLAST launch due to continued slips in completing the Command and Data Handling subsystem, spacecraft testing schedule conflicts with Department of Defense projects, and spacecraft contractor performance issues.	The GLAST Operational Readiness Review and launch are currently scheduled for mid-FY 2008. SMD continues to monitor all its development projects to maintain cost and schedule baselines.
FY 2008 Follow-up: NASA launched GLAST (now called the Fermi Gamma-ray Space Telescope) on June 11, 2008. The mission ultimately exceeded its cost baseline by only five percent, but exceeded the schedule baseline by 32 percent.			

PART Status and Improvement Plans

PART is an evaluation tool developed by the Office of Management and Budget (OMB) to assess the effectiveness of federal programs. It provides a rigorous and interactive method to assess program planning, management, and performance toward quantitative, outcome-driven goals. NASA submits one-third of the Agency's Theme and mission-support program portfolios to OMB each year, resulting in a complete Agency assessment approximately every three years.

The PART assessments ask approximately 25 questions about a Theme's performance and management. Based on answers provided by the Theme, OMB applies a percentile score that yields the following ratings:

- **Effective (85–100%):** This is the highest rating a program can achieve. Programs rated Effective set ambitious goals, achieve results, are well-managed and improve efficiency.
- **Moderately Effective (70–84%):** In general, a program rated Moderately Effective has set ambitious goals and is well-managed. Moderately Effective programs likely need to improve their efficiency or address other problems in the programs' design or management in order to achieve better results.
- **Adequate (50–69%):** This rating describes a program that needs to set more ambitious goals, achieve better results, improve accountability or strengthen its management practices.
- **Ineffective (0–49%):** Programs receiving this rating are not using tax dollars effectively. Ineffective programs have been unable to achieve results due to a lack of clarity regarding the program's purpose or goals, poor management, or some other significant weakness.
- **Results Not Demonstrated:** This rating indicates that a program has not been able to develop acceptable performance goals or collect data to determine whether it is performing.

Of the 13 Themes and programs assessed to date, three are rated Effective, six are rated Moderately Effective, and four are rated Adequate. NASA does not have any Themes or programs rated Ineffective or Results Not Demonstrated. The table below summarizes the FY 2008 PART status and improvement plans for each Theme or program organized by Mission Directorate. For detailed listings of NASA's program measures and assessments or for more on PART, please visit OMB's PART Web site at http://ExpectMore.gov.

<table>
<tr><th colspan="4">Science Mission Directorate</th></tr>
<tr><td colspan="4">Theme: Earth–Sun System</td></tr>
<tr><td colspan="2">Last Year Assessed: 2005</td><td colspan="2">Rating: Moderately Effective</td></tr>
<tr><td>Program Purpose and Design:
100%</td><td>Strategic Planning:
100%</td><td>Program Management:
84%</td><td>Program Results/ Accountability: 74%</td></tr>
<tr><td colspan="4">Rating Rationale: The assessment found that this program is well-defined, with a clear purpose, and has an effective strategic planning process, aligning it well to NASA's mission. A key opportunity to increase effectiveness lies in continuing to improve efficiencies in mission operations, in reducing science data validation periods and in making NASA research available to a broader community. In FY 2008, NASA divided the Earth-Sun System into two distinct Themes: Earth Science, which was reviewed in 2008, and Heliophysics, which will be reviewed at a later date.</td></tr>
<tr><td colspan="2">Previous Year Assessed: None</td><td colspan="2">Rating: N/A</td></tr>
<tr><td>Program Purpose and Design:
N/A</td><td>Strategic Planning:
N/A</td><td>Program Management:
N/A</td><td>Program Results/ Accountability:
N/A</td></tr>
<tr><td colspan="2">Program Improvement Plan:
• Report for major missions on: estimated mission lifecycle 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 lifecycle cost and schedule.

• 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.</td><td colspan="2">Actions as of Spring 2008:
• Action taken; expected completion date 12/31/2009: In August 2007, NASA provided its initial baseline cost/schedule report to OMB, per NSPD 49 implementation. Recently, NASA has updated its process as a result of the FY08 appropriation requirement for project status reports by the GAO. NASA is currently folding in new reporting against a "measure of success" for completion of the Corrective Action Plan for the GAO High Risk List item on Contract Management. This later activity is planned for completion in December.
• Completed: The problems associated with successfully executing research to operations transitions of critical measurements are well known and have been treated by several NRC reports. NASA and its partners have taken some concrete steps to successfully transition mature NASA R&D to other agencies, such as the recent NASA/NOAA Research & Operations Agreement and establishment of a NASA-NOAA working group. Another important accomplishment is the establishment of the U.S. Natl. Land Imaging Program under DOI.</td></tr>
</table>

• 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.	• Completed: The NRC's Earth Science decadal survey expressed support for NASA's Earth Science missions currently in development and recommended priorities for new missions. These priorities are reflected in the FY 2009 President's Budget, which includes increased funding in the current budget horizon for NASA to begin formulation of the first four missions defined, and, depending on the outcome of the formulation activities, to begin development of the most mature of the missions.

Theme: Earth Science

Last Year Assessed: 2008		**Rating:** Moderately Effective	
Program Purpose and Design: 100%	**Strategic Planning:** 100%	**Program Management:** 83%	**Program Results/ Accountability:** 72%
Rating Rationale: The assessment found that Earth Science has effectively demonstrated the use of remotely-sensed data to revolutionize the understanding of Earth's processes. A key opportunity to increase effectiveness lies in improving the government's ability to fully exploit research results and transition key Earth science data sets and technologies to other federal agencies. Cost overruns and schedule delays have become increasingly frequent in Earth Science missions due to a variety of technical, management, and budgetary issues.			
Previous Year Assessed: None (previously part of Earth–Sun System)		*Rating: N/A*	
Program Purpose and Design: N/A	*Strategic Planning: N/A*	*Program Management: N/A*	*Program Results/ Accountability: N/A*
Program Improvement Plan:		**Actions as of Spring 2008:**	
• Report for major missions on: estimated mission lifecycle 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 lifecycle cost and schedule.		• Action taken; expected completion date 12/31/2009: In August 2007, NASA provided its initial baseline cost/schedule report to OMB, per NSPD 49 implementation. Recently, NASA has updated its process as a result of the FY08 appropriation requirement for project status reports by the GAO. NASA is currently folding in new reporting against a "measure of success" for completion of the Corrective Action Plan for the GAO High Risk List item on Contract Management. This later activity is planned for completion in December.	
• Post grantee performance data on a publicly available website.		• Action taken; expected completion date 9/30/2009.	
• Continue to seek efficiencies in Earth Science programs as demonstrated by developing at least one additional efficiency measure covering a greater proportion of the Earth Science budget.		• Action taken; expected completion date 12/31/2008.	
• Benchmark the approach and implementation of the Applied Sciences Program relative to other programs with similar purposes and objectives.		• Action taken; expected completion date 12/31/2008.	

Theme: Solar System Exploration (Planetary Sciences Theme)

Last Year Assessed: 2006		**Rating:** Effective	
Program Purpose and Design: 100%	**Strategic Planning:** 100%	**Program Management:** 91%	**Program Results/ Accountability:** 74%
Rating Rationale: The assessment found that this Theme is well-defined and well-managed, with a clear purpose and direct ties to NASA's Mission. The Theme has relevant research priorities, that reflect the priorities of the planetary science community. Further, it applies lessons learned from past mission failures.			
Previous Year Assessed: 2003		*Rating: Effective*	
Program Purpose and Design: 100%	*Strategic Planning: 100%*	*Program Management: 100%*	*Program Results/ Accountability: 74%*
Program Improvement Plan:		**Actions as of Spring 2008:**	
• Report for major missions on: estimated mission lifecycle 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 lifecycle cost and schedule.		• Action taken; expected completion date 12/31/2009: NASA provided its initial baseline cost/schedule report to OMB in August 2007, per NSPD 49 implementation. Recently, NASA has updated its process as a result of the FY08 appropriation requirement for project status reports by the GAO. NASA is currently folding in new reporting against a "measure of success" for completion of the Corrective Action Plan for the GAO High Risk List item on Contract Management. This later activity is planned for completion in December.	
• NASA will explore options for modifying the current approach to its competed planetary science programs to allow for a healthy mix of missions of various size and scope, potentially including missions to the outer planets.		• Completed: The planetary science program now includes an outer planets flagship mission. After evaluating science, technical risk, and cost considerations, NASA selected Europa, Ganymede, and Titan mission concepts for further definition study. The final selection of mission target will be made in FY08. An accelerated pre-Phase A effort which leverages the past two years of study will then be initiated, culminating in a Mission Concept Review in 2008 and start of formulation activities in early 2009.	
• NASA will define its requirements, approach, projected schedule, and budget profile (with proposed offsets) for Deep Space Network upgrades, in time for the FY 2009 budget submit to OMB.		• Action taken; expected 12/31/2009: This action is expected to move to the Space and Flight Support Theme, hence is not reported on here, and will not be completed until the FY 2010 budget submission.	

Theme: Astronomy and Astrophysics Research (Astrophysics Theme)			
Last Year Assessed: 2007		**Rating:** Adequate	
Program Purpose and Design: 100%	**Strategic Planning:** 100%	**Program Management:** 75%	**Program Results/ Accountability:** 47%
Rating Rationale: The assessment found that the Theme continues to return outstanding, groundbreaking scientific results in support of the community's scientific research priorities. However, significant concern regarding flight program cost and schedule performance was noted.			
Previous Year Assessed—Structure and Evolution of the Universe: 2004		*Rating: Effective*	
Program Purpose and Design: 100%	*Strategic Planning: 100%*	*Program Management: 91%*	*Program Results/ Accountability: 84%*
Program Improvement Plan:		**Actions as of Spring 2008:**	
• Report for major missions on: estimated mission lifecycle 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 lifecycle cost and schedule.		• Action taken; expected completion date 12/31/2009: NASA provided its initial baseline cost/schedule report to OMB in August 2007, per NSPD 49 implementation. Recently, NASA has updated its process as a result of the FY08 appropriation requirement for project status reports by the GAO. NASA is currently folding in new reporting against a "measure of success" for completion of the Corrective Action Plan for the GAO High Risk List item on Contract Management. This later activity is planned for completion in December.	
• Improving flight project cost and schedule performance by changing mission plans, scope, partners, and management where appropriate.		• Action taken; expected completion date 12/31/2009: The JWST project has been maturing technologies to Technology Readiness Level 6 and starting development of long-lead flight hardware during formulation phase. All of the JWST critical technologies reached TRL 6 more than a year before the mission PDR, which was held in April 2008. The Astrophysics Theme also continues to pursue new partnerships in dark energy, X-rays, gravity waves, and exoplanets, as well as expanded cost-sharing with existing partners.	
• Improving performance of partners (including grantees, contractors, cost-sharing partners, and other government partners) towards achieving cost and schedule goals.		• Action taken; expected completion date 12/31/2009: In order to improve contract management, the Astrophysics Theme has instituted Earned Value Management (EVM) reporting for all contractors on major missions. Other efforts include the partial contract termination with the prime contractor for the SOFIA project. NASA is currently negotiating a new contract in order to improve the contractor's performance in areas where the contractor has expertise and redirect other work where the expertise resides either within NASA or at other contractors.	
• Establishing means to maximize return on available resources for flight and research projects as well as metrics to measure efficiencies gained.		• Action taken; expected completion date 12/31/2009: Flagship missions have been added to the review process normally reserved for smaller missions to assess the value of continuation after completion of prime missions. NASA held an Astrophysics Senior Review for Operating Missions in April, including both Chandra and Spitzer. The result was to extend Spitzer for one additional year for warm operations and continue Chandra operations at a reduced level. The Division is also evaluating efficiency metrics for inclusion in the FY10 Performance Plan.	
• Making grantee annual performance data available on the NASA web site.		• Action taken; expected completion date 6/30/2009: NASA is currently working with the Research.gov consortium led by NSF to list the Agency's grant awards on the publicly available Research.gov website. The next standard service to be added to the web site is the provision of grantee annual performance reports. NASA is actively participating in the establishment of requirements for this new service, which is expected to be operational in 2009.	

Aeronautics Research Mission Directorate

Theme: Aeronautics Technology			
Last Year Assessed: 2007		**Rating:** Effective	
Program Purpose and Design: 100%	**Strategic Planning:** 100%	**Program Management:** 91%	**Program Results/ Accountability:** 78%
Rating Rationale: The assessment found that this Theme has a clear purpose, is well designed, and focuses on research that is appropriate for government, consistent with the National Aeronautics R&D Policy, and has a comprehensive set of ambitious but realistic performance measures.			
Previous Year Assessed: 2004		*Rating: Moderately Effective*	
Program Purpose and Design: 100%	*Strategic Planning: 100%*	*Program Management: 73%*	*Program Results/ Accountability: 67%*

Program Improvement Plan:	Actions as of Spring 2008:
• Conduct an annual review by experts from outside the program, FFRDC, and/or from other government agencies to assess the restructured Aeronautics Research Mission Directorate program's quality of research and alignment with national priorities. The review will determine how well the program is aligned with the stated objectives of the NASA Strategic Plan and the National Aeronautics Research and Development Policy, identify any gaps, and assess the quality of the research. ARMD will setup the charter and validation of the annual review to meet the standards of Independent Evaluation (to be completed in January 2008).	• Completed: Independent annual reviews of ARMD Aviation Safety, Fundamental Aeronautics, Airspace Systems, and Aeronautics Test programs were completed by December 2007. Other government agencies represented on the independent review panels were the Federal Aviation Administration, National Transportation Safety Board, National Oceanic and Atmospheric Administration, Department of Defense, U.S. Army, U.S. Air Force, U.S. Navy, and the National Science Foundation.
• Complete the independent assessment of NASA's fundamental aeronautics research, contracted to the National Research Council of the National Academies—study, titled "Evaluation of NASA's Fundamental Aeronautics Research Program." (To be released publicly June 2008; preliminary report due in March 2008.)	• Action taken; expected completion date 4/01/08: The preliminary report, titled *NASA Aeronautics Research: An Assessment*, was released in April 2008. The final report is estimated for release in June 2008, and this action will be closed when the final report is received.
• Ensure that NASA's aeronautics research is in alignment with the research needs of the Next Generation Air Transportation System (NextGen) as defined in the NextGen Research and Development Plan and Integrated Work Plan.	• Completed: ARMD supports 84 of the 163 R&D needs in the NextGen R&D Plan. NASA contributed to all JPDO planning products, including the Concept of Operations, the Enterprise Architecture, the R&D Plan, and the Integrated Work Plan. NASA/JPDO senior management held the first two of ongoing quarterly review meetings. NASA worked with the FAA and JPDO to elevate and coordinate environmental and safety R&D. NASA wrote a white paper describing its support to NextGen (at http://www.aeronautics.nasa.gov).
• Under the leadership of PA&E, benchmark R&T practices in performance and budget integration and performance measurement (i.e. efficiencies and evaluations) with other government agencies.	• Action taken; expected completion date 12/31/09: This will be an on-going set of activities with participation of multiple NASA organizations. NASA has been participating on the Performance Improvement Council Inter-Agency Working Groups, with many other federal agencies, to look at best practices on performance evaluation, metrics and reporting. Participation allows for ample opportunity to informally and formally benchmark across common federal programs. NASA plans to continue on with this activity.

Exploration Systems Mission Directorate

Theme: Constellation Systems

Last Year Assessed: 2006		**Rating:** Adequate	
Program Purpose and Design: 100%	**Strategic Planning:** 78%	**Program Management:** 75%	**Program Results/ Accountability:** 40%

Rating Rationale: The overall rating of Adequate reflected a strong ability to convey the Theme's purpose and design, combined with a low rating in program accountability. This was due to a lack of independent review planning at that time, as well as an inability to demonstrate performance and efficiencies due to the immaturity of the program, which was still in formulation at that time.

Previous Year Assessed: None		*Rating: N/A*	
Program Purpose and Design: N/A	*Strategic Planning: N/A*	*Program Management: N/A*	*Program Results/ Accountability: N/A*

Program Improvement Plan:	Actions as of Spring 2008:
• Conduct planned internal reviews.	• Action taken; expected completion date 9/30/2008: In Nov. 2007, NASA completed the integrated stack sync point for CEV and CLV that demonstrated preliminary designs and established the basis for proceeding to the program level SDR once EVA, Mission Ops and Ground Ops complete their SDR reviews. The CEV and CLV project offices are finalizing data products required to meet their individual project level PDRs, planned for late 2008. Another sync point is currently scheduled for Dec 2008 aligning all projects towards the Prog. level PDR later in 2009.
• Plan and conduct comprehensive external program review.	• Action taken; expected completion date 9/30/2008: NASA has implemented SRB for each project and program that assesses the programmatic performance of the project/program per established criteria. To date, the program completed its SRR review in Sept 2007 and successfully completed an Agency KDP of Pre-Program Approval Review (PPAR) in Oct 2007, and is now working towards its 2nd KDP (PAR) in December 2008. The CLV and CEV projects successfully accomplished their SDR KDP (PNAR) in spring 2008 and are aggressively working towards the next KDP.
• Develop and baseline metrics for transition of activities and assets from Space Operations to Constellations Systems.	• Action taken; expected completion date 9/30/2008: Baseline metrics (i.e., cost, schedule, throughput, effectiveness) for transition of activities and assets from Space Operations to Constellations Systems are under development. The program is working closely with SOMD to ensure metrics are captured.

Theme: Advanced Capabilities			
Last Year Assessed: 2007		**Rating:** Adequate	
Program Purpose and Design: 100%	**Strategic Planning:** 90%	**Program Management:** 75%	**Program Results/ Accountability:** 45%
Rating Rationale: The evaluation validated that the Theme's programs were focused on providing knowledge and technology to enable future human exploration missions beyond low Earth orbit. The Advanced Capabilities Theme did not receive a higher rating largely due to the following reasons: the Theme had not received independent evaluations of sufficient scope and quality; and the Theme had not demonstrated sufficient efficiencies.			
Previous Year Assessed (HSRT): 2005		*Rating (HSRT): Adequate*	
Program Purpose and Design (HSRT): 100%	*Strategic Planning (HSRT): 100%*	*Program Management (HSRT): 91%*	*Program Results/ Accountability (HSRT): 48%*
Program Improvement Plan: • Enter into an arrangement with the National Research Council for an independent assessment of NASA's restructured Exploration Technology Develop Program (ETDP) to determine how well the program is aligned with the stated objectives of the Vision for Space Exploration and assess the quality of the research. ETDP will report, and incorporate NRC recommendations into the Exploration Technology Development Program. • Establish an ongoing process to perform independent retrospective evaluations of the quality of Human Research Program (HRP). Conduct an independent evaluation for HRP to demonstrate the new process. • Establish means to maximize return on available resources, metrics to measure efficiencies gained, and demonstrate improved efficiencies for Space Radiation Research Facility. • Under the leadership of PA&E, benchmark R&T practices in performance and budget integration and performance measurement (i.e., efficiencies and evaluations) with other government agencies.		**Actions as of Spring 2008:** • Completed: The results of the committee's study as of December 2007 were presented in an interim report published in April 2008. The committee's final report, described below, is planned for release in the summer of 2008. The interim report of the committee can found at: http://www.nap.edu/catalog.php?record_id=12189. • Completed: The ongoing processes to perform independent quality evaluations are: The Institute of Medicine of the National Academies review of "NASA Research on Human Health Risks" with a completion date of July 2008; The Independent Program Implementation Review which was started in February 2008 and will complete in September 2008. In addition, the Human Research Program has established a Non-Advocate Review process to evaluate all the directed research projects using independent panels. • Completed: NASA established an efficiency baseline for measurement on the research throughput of the NASA Space Radiation Laboratory (NSRL) in 2006. There were efficiencies seen in 2007 as recorded by the PART metric. NASA will continue to strive for efficiencies in this area and will maintain this as an performance improvement action for several years as the Agency assures this is tracked and achieved. • Action taken; expected completion date 12/31/2009: This will be an on-going set of activities with participation of multiple NASA organizations. NASA has been participating on the Performance Improvement Council Inter-Agency Working Groups, with many other federal agencies, to look at best practices on performance evaluation, metrics and reporting. Participation allows for ample opportunity to informally and formally benchmark across common federal programs. NASA plans to continue on with this activity.	

Space Operations Mission Directorate

Theme: Space Shuttle			
Last Year Assessed: 2005		**Rating:** Adequate	
Program Purpose and Design: 100%	**Strategic Planning:** 89%	**Program Management:** 50%	**Program Results/ Accountability:** 33%
Rating Rationale: The Space Shuttle Theme received FY 2005 PART rating of Adequate as an update to its original FY 2003 rating of Results Not Demonstrated. The original rating was received while the Space Shuttle was still on its path to a return to flight in the aftermath of the Columbia accident. The reasons for the updated rating include a well-defined purpose and system design, benefiting from strong strategic planning. To perform beyond an Adequate rating, improvements are required in the areas of program management and program results. The Space Shuttle Program is taking steps to improve programmatic and financial management, and identify the program benefits from several successful missions, including return to ISS assembly in September 2006.			
Previous Year Assessed: 2003		*Rating: Results Not Demonstrated*	
Program Purpose and Design: 80%	*Strategic Planning: 44%*	*Program Management: 88%*	*Program Results/ Accountability: 7%*
Program Improvement Plan: • Return the Shuttle safely to flight and continue using it to support the Space Station.		**Actions as of Spring 2008:** • Action taken; expected completion date 9/30/2010: Between July 2005 and December 2007, the Space Shuttle Program has returned to flight and successfully completed seven flights to the International Space Station. The program recovered from significant hail damage while STS-117 was on the launch pad and succeeded in flying three missions in 2007. Program performance since return to flight continues to support the completion of the International Space Station by no later than September 30, 2010.	

• Develop outcome-oriented short and long-term measures for the Space Shuttle Program.	• Completed: The Space Shuttle Program has developed outcome-oriented long- and short-term measures. These may be found in the metric section of this PART review and in the NASA fiscal years 2006 and 2007 annual performance plans.
• Plan to retire the Shuttle by the end of the decade, when its role in assembling the International Space Station is complete.	• Completed: Plans are in place. Revised ISS assembly sequence approved by international partners. Results from Return to Flight missions STS-114 and STS-121 support the manifest for completing ISS assembly and, potentially, a fifth servicing mission to Hubble by 2010. Human Spaceflight Transition Plan complete. Transition and integration control boards established within the Shuttle program and at the Mission and Agency level to coordinate transition activities between Shuttle and the Constellation Program.
• Develop outcome-oriented measures to assess the effectiveness of the transition between the Space Shuttle and exploration programs.	• Action taken; expected completion date 12/31/2008: NASA continues to track (through metrics) the sharing and disposition of facilities, property, and capabilities no longer needed for the safe completion of the SSP manifest, and to coordinate those activities across the Space Shuttle, ISS, and Constellation programs through program and HQ-level control boards to ensure best value for the Agency. An update to the Agency-level Transition Plan will be released in the second quarter of FY 2008 and will include updates to transition measures.

Theme: International Space Station

Last Year Assessed: 2008		**Rating:** Effective	
Program Purpose and Design: 100%	**Strategic Planning:** 100%	**Program Management:** 88%	**Program Results/ Accountability:** 80%
Rating Rationale: The assessment found that the program had greatly improved its management, particularly in the area of cost control and had effectively managed its budget reserves. Further concern was expressed that the ISS was extremely dependent on the Space Shuttle. The original rating was due to delays in meeting the goals of the ISS Program in the aftermath of the Columbia accident. The ISS program continues to address the concern of dependency on the Space Shuttle.			
Previous Year Assessed: 2004		*Rating: Moderately Effective*	
Program Purpose and Design: 100%	*Strategic Planning: 100%*	*Program Management: 88%*	*Program Results/ Accountability: 47%*
Program Improvement Plan: • Develop alternatives to the Space Shuttle for resupplying the International Space Station.		**Actions as of Spring 2008:** • Action taken; expected completion date 12/31/2009: The ISS Program has negotiated balance of contribution agreements with ESA and JAXA to provide cargo delivery services to the ISS. NASA has also purchased cargo delivery services from the Russians through 2011 but will not purchase any cargo beyond 2011. NASA's primary cargo acquisition strategy, which is still in development, is to purchase domestic commercial cargo capabilities in the post-Shuttle timeframe. NASA is also developing a backup strategy to purchase Partner capabilities in the event domestic providers are not available.	

Theme: Space and Flight Support

Last Year Assessed: 2007		**Rating:** Moderately Effective	
Program Purpose and Design: 100%	**Strategic Planning:** 100%	**Program Management:** 88%	**Program Results/ Accountability:** 61%
Rating Rationale: The SFS Theme continues to meet existing NASA needs such as reliable communication and navigation services for space missions, safe and cost-effective access to space on commercial launch vehicles, and rocket testing for current and future programs. Steps that were taken to improve included the increased use of independent assessments and the development of relevant performance measures that will provide the indication if program outcomes are being met.			
Previous Year Assessed: 2004		*Rating: Adequate*	
Program Purpose and Design: 100%	*Strategic Planning: 67%*	*Program Management: 88%*	*Program Results/ Accountability: 45%*
Program Improvement Plan: • Continue to fund the program at an essentially flat level, but strive to improve the program's results by increasing efficiency. • Develop better measures that will help to drive program improvement.		**Actions as of Spring 2008:** • Action taken; expected completion date 9/30/2009: SFS funding remains flat with exception of the development of the TDRS K/L project in SC. LSP has partnered with existing program to streamline and share center infrastructure capabilities such as network cables. The RPT program through the shared Test Operations Contract has gained efficiencies by consolidating certain management and administrative functions while achieving existing test milestones. SFS has a new efficiency measure developed last year, NASA will track for a year or two. • Completed: NASA revisited the Crew Health and Safety metrics to get better aligned with the Agency's mission. New measures and metrics for . Space and Flight Support developed new measures and metrics as part of their PART review last year..	

• Collect efficiency data consistently and annually for all program activities, report performance against the program's established metrics and targets, and compare/ benchmark these results to similar services available from private industry or other emerging commercial providers to ensure the best value to the government.	• Action taken; expected completion date 9/30/2009: Efficiency metric created in 2006. 2007 data reported under the Program Performance Measures section. NASA will continue to track this measure for another year or two.
• Based on a detailed review of which Space and Flight Support assets will be needed post-Shuttle retirement, develop a plan that assesses the most cost-effective way to sustain necessary capabilities and tracks their performance and efficiency, during a this period of possible reduced demand.	• Action taken; expected completion date 9/30/2011: LSP has no assets used by Shuttle that will impact the program post-Shuttle Retirement. However, there are some KSC/Shuttle assets such as the communication infrastructure and propellant servicing equip. that could impose cost impacts to LSP. Potential impacts remain unclear until Constellation requirements are known. The RPT Program completed a Facility Alignment Utilization Study in June 2007. RPT is using output from the study to develop a planning model for test stand requirements.
• During the period of post-Shuttle retirement through human lunar operations, identify budget impacts for the Space Communications program to meet changing requirements for human and robotic space communications. Develop plan for the most cost-effective way to sustain necessary capabilities, track performance and efficiency, and meet the changing lunar operations requirements.	• Action taken; expected completion date 3/30/2009: Requirements are being iterated with the Mission Directorates in order to assess alternative architectures. Based on requirements, a Systems Engineering Team comprised of experts from performing SCaN Centers and HQ Mission Directorates will develop an Integrated Space Communications Architecture roadmap.

Cross-Agency Support Programs

Theme: Education

Last Year Assessed: 2008		**Rating:** Moderately Effective	
Program Purpose and Design: 100%	**Strategic Planning:** 100%	**Program Management:** 80%	**Program Results/ Accountability:** 53%

Rating Rationale: In 2007**,** NASA's Education Theme received a PART rating of Results Not Demonstrated. NASA has taken several steps to improve the Education Theme's potential to strengthen and measure its performance. For instance, the Agency developed a new education framework and implementation plan, as well as new metrics by which to evaluate Education's achievement of intended outcomes. Education has made considerable progress in focusing its plans on achieving meaningful outcomes. It has established baseline performance standards and has begun to collect and report some performance data against its new metrics. Education also has developed a solid plan and set aside resources to conduct independent evaluations of the portfolio's effectiveness and efficiency; now Education must implement that plan.

Previous Year Assessed: 2007		*Rating: Results not Demonstrated*	
Program Purpose and Design: 100%	*Strategic Planning: 88%*	*Program Management: 60%*	*Program Results/ Accountability: 33%*

Program Improvement Plan:	**Actions as of Fall 2008:**
• Expand the scope of the performance data reported against the program's metrics such that the program measures and reports the majority of its portfolio's performance.	• Action taken; expected completion date 9/30/2010.
• Conducting independent evaluations to assess the program's effectiveness and efficiency against the program's established metrics and performance goals and applying resources based on the results.	• Action taken; expected completion date 9/30/2010: Awarded contract to conduct independent evaluations to assess the program's effectiveness and efficiency against program's established metrics and performance goals. Under task orders, contractor will conduct objective, reliable, and valid evaluations of project effectiveness. Office has reviewed recommendations from National Academies study and will begun adjusting programming. FY08 projects for evaluation include Tribal, HIS, HBCU collaborations, EPSCoR, MUREP.
• Offering opportunities not addressed by other agencies and that are unique in their use of NASA's resources and benefits to NASA's mission and collaborating with other agencies where appropriate.	• Action taken; expected completion date 9/30/2010: Completed the Benchmark Study; All FY08 higher education solicitations (Space Grant, EPSCoR, URC, etc.) specifically map to, and require research on, current mission directorate science and engineering priorities. Contracted OPM TMAP to assist in analysis for mission appropriate expansion and collaboration. Ongoing coordination through National Science and Technology Council Education Subcommittee and Interagency Aerospace Revitalization Task Force.
• Avoiding duplication with other NASA education programs.	• Action taken; expected completion date 9/30/2010: Office of Education chairs ECC to ensure consistency of program formulation, strategy, and implementation. The Office coordinates and integrates NASA's education strategic framework, implementation approach, and policies. AA for Education leads development of an implementation plan (goals, objectives, and metrics) to guide Agency external education programs and for monitoring and reporting progress against goals and objectives. AA establishes the Agency APGs. Codified in NPD 1000.3c Section 4.13.2.2.

• Fully execute the new education investment framework, per the framework's implementation plan, to complete the strategic alignment of the Education portfolio that best supports the Agency strategic direction and the U.S. National Space Policy. This action is a continuation of a former follow-on action to develop the investment framework and implementation plan.	• Action taken; expected completion date 9/30/2010: Framework adopted and codified it in NPD 1000.3c. Headquarters' Office of Education staffing completed. Review of portfolio, recommendations from NRC study, and external evaluations will inform future budget allocations. Per framework, and adopted by ECC, phased implementation is in 4th phase. Contractor hired and has produced draft literature review and benchmark study.
• Completing the consolidation of the program's three performance information databases into a single database system.	• Action taken; expected completion date 9/30/2009.

Theme: Integrated Enterprise Management Program

Last Year Assessed: 2006		**Rating:** Moderately Effective	
Program Purpose and Design: 80%	**Strategic Planning:** 100%	**Program Management:** 88%	**Program Results/ Accountability:** 67%

Rating Rationale: The rating reflects that the program addresses clear and existing needs of the Agency. The implementation of business systems across NASA allows timely access to standardized, agencywide data. The program had achieved progress towards long-term goals but has remaining work. For example, at the time of the review, the program had implemented several software modules to improve financial management but the software did not provide adequate functionality, specifically in regards to compliance with the Federal Financial Management Improvement Act. Also, in 2006, NASA had yet to formulate a complete, concrete, and realistic plan for a clean audit.

Previous Year Assessed: None		*Rating: N/A*	
Program Purpose and Design: N/A	*Strategic Planning: N/A*	*Program Management: N/A*	*Program Results/ Accountability: N/A*

Program Improvement Plan:	**Actions as of Fall 2007:**
• Upgrading the Agency's Financial Software System (SAP) to improve NASA's compliance with the Federal Financial Management Improvement Act.	• Action taken; expected completion date 12/31/2009: 1) SAP upgraded software was put into production at FYE. Users began using the system on November 13, 2006. 2) IEMP will work with the OCFO to assess and ensure NASA's compliance with the Federal Financial Management Improvement Act.
• Clarifying and prioritizing requirements for future business systems.	• Action taken; expected completion date 12/31/2008: 1) IEMP has formed the Management/Business Systems Integration Group to gather and prioritize Agency requirements for IEMP. 2) Established the NASA Management/Business Systems Integration Group (M/BSIG) Charter to define functions and membership. 3) M/BSIG to clarify and prioritize requirements for future business systems.
• Supporting the Office of the Chief Financial Officer in obtaining a clean audit.	• Action taken; expected completion date 12/31/2009: IEMP will meet with the OCFO after the external auditors publish the Agency's audit results to identify areas where IEMP can make system improvements to assist with trouble areas as identified by the auditors.

Theme: Innovative Partnerships Program

Last Year Assessed: 2008		**Rating:** Moderately Effective	
Program Purpose and Design: 80%	**Strategic Planning:** 100%	**Program Management:** 89%	**Program Results/ Accountability:** 61%

Rating Rationale: The assessment found that the Innovative Partnerships Program (IPP) is working to maximize the return on NASA's technology investments by conducting several non-traditional, low-cost programs to promote technology flow into and out of NASA, as well as by planning to focus Small Business Innovative Research/Small Business Technology Transfer Program awards on projects expected to provide the greatest possible technological benefit to the Agency. IPP has established meaningful performance measures as well as ambitious performance targets based on recent performance trends. The continued collection of performance data, as well as the conduct of regular independent evaluations over the next several years, will be essential to assess the effectiveness and efficiency of IPP's current approaches to technology infusion and transfer.

Previous Year Assessed: None		*Rating: N/A*	
Program Purpose and Design: N/A	*Strategic Planning: N/A*	*Program Management: N/A*	*Program Results/ Accountability: N/A*

Program Improvement Plan:	**Actions as of Fall 2008:**
• Conduct regular independent evaluations to assess the program's effectiveness and efficiency against the program's established objectives and performance goals and apply resources based on the results.	• No action taken; expected completion date 12/31/2010.
• Complete, institutionalize, and document the enhanced Intellectual Property (IP) management process to enable NASA's increased use of IP to meet its mission goals.	• No action taken; expected completion date 12/31/2009.
• Collect consistent performance information annually for all program activities in a system that meets performance data verification and validation requirements and report the data against the program's established metrics and targets.	• No action taken; expected completion date 12/31/2009.

Theme: Strategic Capabilities Assets Program

Last Year Assessed: None	**Rating:** N/A

NASA's Locations

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http://www.nasa.gov/centers/hq/

Ames Research Center (ARC)
Moffett Field, CA 94035-1000
http://www.nasa.gov/centers/ames/

Dryden Flight Research Center (DFRC)
P.O. Box 273
Edwards, CA 93523-0273
http://www.nasa.gov/centers/dryden/

John H. Glenn Research Center at Lewis Field (GRC)
21000 Brookpark Road
Cleveland, OH 44135-3191
http://www.nasa.gov/centers/glenn/

Goddard Space Flight Center (GSFC)
8800 Greenbelt Road
Greenbelt, MD 20771-0001
http://www.nasa.gov/centers/goddard/

Jet Propulsion Laboratory (JPL)
4800 Oak Grove Drive
Pasadena, CA 91109-8099
http://www.nasa.gov/centers/jpl/

Lyndon B. Johnson Space Center (JSC)
Houston, TX 77058-3696
http://www.nasa.gov/centers/johnson/

John F. Kennedy Space Center (KSC)
Kennedy Space Center, FL 32899-0001
http://www.nasa.gov/centers/johnson/

Langley Research Center (LaRC)
Hampton, VA 23681-2199
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George C. Marshall Space Flight Center (MSFC)
Huntsville, AL 35812-0001
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John C. Stennis Space Center (SSC)
Stennis Space Center, MS 39529-6000
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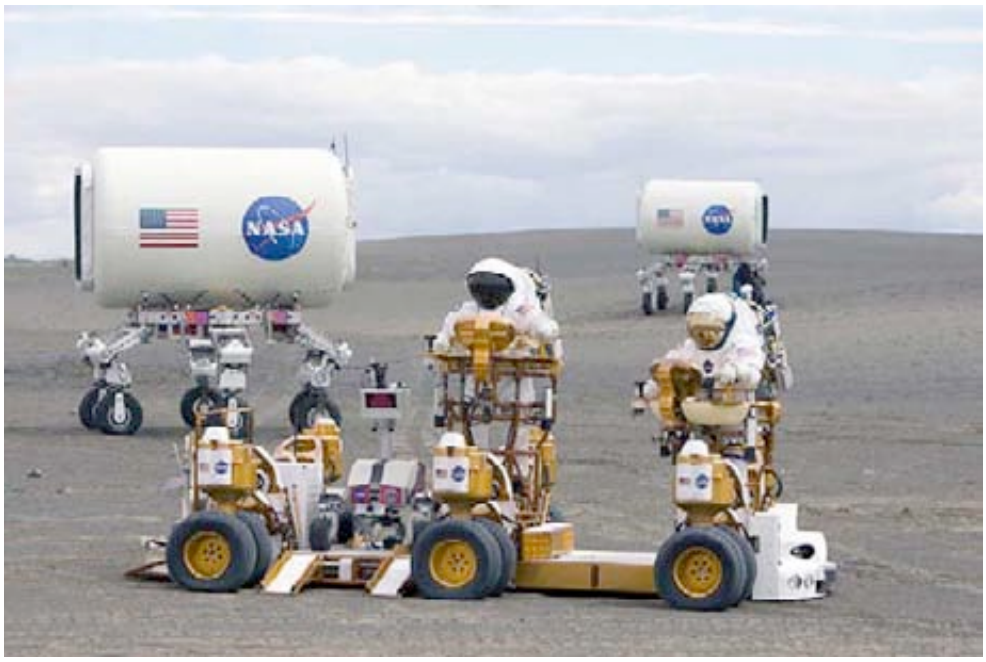

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