National Aeronautics and Space Administration

Annual Performance Report

FISCAL YEAR 2007

www.nasa.gov

Management and Performance: FY 2007 PAR Annual Performance Report

NASA's annual Performance and Accountability Report (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. The PAR provides a summary of the Agency's financial position and its progress towards achieving NASA's performance measures (i.e., Strategic Goals and Sub-goals, Outcomes, and Annual Performance Goals).

NASA's Participation in the Performance and Accountability Report Pilot Program

For FY 2007, NASA chose to participate in the Office of Management and Budget's (OMB's) PAR pilot program, as described in OMB Circular A-136. This pilot entails producing three reports as an alternative to the consolidated PAR:

- An Agency Financial Report (AFR), which provides NASA's financial statements and accompanying notes, an audit of the financial statements, a summary of materials weaknesses and management challenges, as well as corrective actions, and an overview of the year's performance achievements. NASA issued this report on November 15, 2007.
- An Annual Performance Report (APR), presented here, detailing NASA's performance towards achieving the FY 2007 Performance Plan.
- A Performance Highlights document, which is a public-outreach summary of NASA's performance, financial, and management achievements and challenges. NASA issued this document on February 1, 2008.

The AFR and Performance Highlights document, as well as NASA's FY 2009 Budget Estimates with accompanying APR, are available on the Web at www.nasa.gov/news/budget/index.html.

APR Contents

Strategic Goals, Performance Measures, and Organization

NASA's 2006 Strategic Plan established six Strategic Goals, with six Sub-goals supporting Strategic Goal 3. Progress towards achieving the Strategic Goals are measured using multi-year Outcomes and supporting Annual Performance Goals, as outlined in the Agency's annual Performance Plan.

NASA is organized into four Mission Directorates and an equivalent organization called Cross-Agency Support Programs:

- 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. This Directorate also develops increasingly refined instrumentation, spacecraft, and robotic techniques in pursuit of NASA's science goals.

- 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 **Exploration Systems Mission Directorate (ESMD)** develops systems and supports research and technology development to enable sustained and affordable human and robotic space exploration. This Directorate will develop the robotic precursor missions, human transportation elements, and life support systems for the near-term goal of lunar exploration.
- The **Space Operations Mission Directorate (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 (ISS). This Directorate 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.
- **Cross-Agency Support Programs (CASP)** consists of four mission-support areas—Education, Advanced Business Systems (performed by the Integrated Enterprise Management Program), the Innovative Partnerships Program, and the Strategic Capabilities Assets Program—that serve all the Strategic Goals. Together, these areas ensure that NASA has the workforce, technologies, capabilities, and facilities needed to achieve NASA's current and future objectives.

Management for these organizations resides at NASA Headquarters. NASA's Centers support the Agency's space exploration objectives, scientific initiatives, and aeronautics research.

The Mission Directorates and CASP pursue the Agency's performance measures, presented in the FY 2007 Performance Plan, as shown below. Details of activities for each Strategic Goal are provided in the following pages.

Responsible Mission Directorate or Equivalent	Theme	Strategic Goals and Sub-goals	Outcomes
		Strategic Goal 3: Sub-goal 3A (Earth Science) Sub-goal 3B (Heliophysics)	 3A.1–3A.7 3B.1–3B.3
	Solar System Exploration (now Planetary Science*)	Strategic Goal 3: Sub-goal 3C	 3C.1–3C.4
	The Universe (now Astrophysics*)	Strategic Goal 3: Sub-goal 3D	 3D.1–3D.4
ARMD	Aeronautics Technology	Strategic Goal 3: Sub-goal 3E	 3E.1–3E.4
ESMD	Constellation Systems	Strategic Goal 4 Strategic Goal 5	4.1–4.2 5.2
	Exploration Systems Research & Technology (now Advanced Capabilities*)	Strategic Goal 5 Strategic Goal 6	5.3 6.1–6.3
	Human Systems Research & Technology (now Advanced Capabilities*)	Strategic Goal 3: Sub-goal 3F	 3F.1–3F.3
SOMD	Space Shuttle	Strategic Goal 1	1.1–1.2
	International Space Station	Strategic Goal 2	2.1–2.2
	Space and Flight Support	Strategic Goal 5 Strategic Goal 6	5.1 6.4
CASP	Education	Contribute to all Strategic Goals	ED-1–ED-3
	Advanced Business Systems		IEM-1–IEM-2
	Innovative Partnerships Program		IPP-1
	Strategic Capabilities Assets Program		SC-1

* Changes effective with the release of NASA's FY 2008 Budget Estimates.

Measuring NASA's Performance

Performance System

NASA managers calculate ratings for multi-year Outcome and 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 of the program. (Program's are identified in NASA's annual budget estimates, available at http://www.nasa.gov/news/budget/index.html.) Based on the ratings, managers formulate appropriate follow-up actions.

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 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 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 measures in past performance years.

During FY 2007, NASA reviewed the trending information for Outcomes to ensure completeness and made revisions where necessary. NASA incorporated the revised trending information in this Annual Performance Report.

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 (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.

Summaries of all 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 go to "PART Status and Improvement Plans" section of this APR (Man-133) or visit ExpectMore.gov (www.whitehouse.gov/omb/expectmore/agency/026.html).

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.

Cost of Performance

Although NASA allocates budgets and tracks costs for each of the Mission Directorates, the Agency also analyzes the cost of pursuing each of its Strategic Goals and Sub-goals, referred to as the Cost of Performance.

To measure the cost of performance, NASA maps the Mission Directorate's costs (i.e., Lines of Business as presented in the FY 2007 Agency Financial Report Addendum 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.

To determine the Agency's cost of performance for each Strategic Goal and Sub-goal, 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.

Strategic Goal 1

Fly the Shuttle as safely as possible until its retirement, not later than 2010.

	Green	Yellow	Red	White
2 Outcomes	2 (100%)	0	0	0
6 APGs	5 (83%)	0	0	1 (17%)

Cost of Performance (in millions)
$4,049

Responsible Mission Directorate

Space Operations

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 International Space Station (ISS). As required by Strategic Goal 1, NASA will retire the 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 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 Space Shuttle Program also provides direct benefits to the Nation by advancing national security and economic interests in space and spurring technology development in critical areas such as navigation, computing, materials, and communications. Furthermore, due to its heavy-lift capacity, the Shuttle is the only vehicle capable of completing assembly of the ISS in a manner consistent with NASA's International Partner commitments and exploration research needs. The remaining Shuttle flights will be dedicated to ISS construction and a Hubble Space Telescope service mission.

A primary public benefit of retiring the Shuttle is to redirect resources toward new programs, such as the Orion Crew Exploration Vehicle and the Ares launch vehicles 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 Shuttle operations to build a new generation of vehicles designed for missions beyond low Earth orbit. As the Shuttle fleet approaches its retirement year, the Agency gradually is directing Shuttle personnel, assets, and knowledge toward the development and support of new hardware and technologies that will support Constellation Systems vehicle. 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 Shuttle manifest. Second, NASA must manage the process of retiring the Shuttle and transitioning and dispositioning Shuttle capabilities when they are no longer needed for safe mission execution.

The Space Shuttle transition and retirement effort is one of the largest that the Agency has undertaken in its history. The Space Shuttle Program's assets are significant; the program occupies over 640 facilities, uses over 990,000 line items of hardware and equipment, and employs over 1,700 civil servants, with more than 15,000 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 over 1,500 active suppliers, and 3,000 to 4,000 qualified suppliers geographically located throughout the country.

Because of the size, complexity, and dispersion of the Space Shuttle 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 manage and protect those Shuttle capabilities that are needed to complete the Agency's Strategic Goal of completing assembly of the ISS by the end of FY 2010 using as few Shuttle flights as possible. As ISS assembly is completed and the Space Shuttle Program's mission comes to a close, Constellation Systems 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 Space Shuttle Program plays a key role in coordinating the smooth transition from current Shuttle operations to Constellation Systems, 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 2008 Performance Forecast

- The Space Shuttle is manifested to fly five missions in FY 2008: four assembly and logistics flights to the ISS and a fifth servicing mission to the Hubble Space Telescope. During the flights to the ISS, the Shuttle will deliver major International Partner elements, including the European Space Agency's Columbus European Laboratory Module, portions of the Kibo Japanese Experiment Module, and Canada's Special Purpose Dexterous Manipulator.
- The Space Shuttle Program will reach several major transition milestones. Among these include transitioning to Constellation Systems major facilities at the Kennedy Space Center, including two of the four high bays in the Vehicle Assembly Building and Launch Pad 39B.

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

FY04	FY05	FY06	FY 2007
8.3.1 Green	6.1 Green	1.1 Yellow	**Green**

The Space Shuttle Program successfully completed three missions—STS-116, STS-117, and STS-118—and accomplished all primary mission objectives. The program achieved its Annual Performance Goals despite events that could have caused setbacks: significant damage to the external tank of STS-117 caused by a hailstorm at the Kennedy Space Center, while the Shuttle was on the pad awaiting launch; and the threat posed by Hurricane Dean to operations at the Johnson Space Center during the STS-118 mission.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Achieve zero Type-A (damage to property at least $1M or death) or Type-B (damage to property at least $250K or permanent disability or hospitalization of 3 or more persons) mishaps in FY 2007.	4SSP2 Yellow	5SSP1 Green	6SSP1 Red	**7SSP1 Green**
Complete 100 percent of all mission objectives for all Space Shuttle missions in FY 2007 as specified in the Flight Requirements Document for each mission.	None	None	None	**7SSP2 Green**

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

FY04	FY05	FY06	FY 2007
None	None	None	**Green**

In November 2006, NASA published the Human Space Flight Transition Plan, which outlines the Agency's approach to safely managing the remaining manifested Space Shuttle flights, completing ISS assembly, and developing new human space flight transportation systems under the Constellation Systems Program. Through joint budget development, workforce sharing, and joint review boards, including the Transition Control Board and the Joint Integrated Control Board, the Space Shuttle and Constellation Systems programs identified a number of assets for transfer or disposition. In the area of joint utilization, Shuttle and Constellation Systems are coordinating use of Launch Complex 39-B at the Kennedy Space Center to

support the Ares I-X test flight and launch-on-need support for the Hubble Space Telescope servicing mission (STS-125), the Vehicle Assembly Building at the Kennedy Space Center for Ares I-X and Space Shuttle processing, and the Michoud Assembly Facility in Louisiana for Shuttle external tank production and Orion and Ares I upper stage production. NASA also began close-out activities for Shuttle capabilities no longer needed for mission execution or Constellation Systems development, including facilities for producing Space Shuttle main engine components and facilities at the White Sands Test Facility used for testing orbiter maneuvering system rocket engines.

FY 2007 Annual Performance Goal	FY04	FY05	FY06	FY 2007
Demonstrate continued progress in identifying, evaluating, documenting, and dispositioning Space Shuttle program resources for phase-out or transition.	None	None	None	**7SSP3 Green**

Efficiency Measures

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Complete all development projects within 110% of the cost and schedule baseline.	4SSP4 Yellow	5SSP4 Yellow	6SSP2 White	**7SSP4 White**
Deliver at least 90% of scheduled operating hours for all operations and research facilities.	None	5SSP5 Green	6SSP3 Green	**7SSP5 Green**
While ensuring the safety of ongoing flight operations and by working with exploration development programs, reduce Space Shuttle sustaining engineering hours, annual value of Space Shuttle production contracts, and the number of dedicated Space Shuttle facilities, where possible.	None	None	None	**7SSP6 Green**

Why NASA rated APG 7SSP4 White: SOMD was not scheduled to complete any development projects in the Space Shuttle Theme during FY 2007, so NASA has postponed this Efficiency Measure until a later fiscal year.

Strategic Goal 2

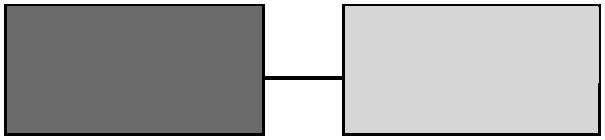
Complete the International Space Station in a manner consistent with NASA's International Partner commitments and the needs of human exploration.

	Green	Yellow	Red	White
2 Outcomes	2 (100%)	0	0	0
7 APGs	6 (86%)	0	0	1 (14%)

Cost of Performance (in millions)
$1,769

Responsible Mission Directorate

Contributing Theme



Theme Description

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	2004	Moderately Effective	100%	100%	88%	47%

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. 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 of the long-term effects of the space environment on human beings. The ISS also enables research in fundamental physics and biology, materials sciences, and medicine. Crewmembers test processes for repairing equipment in microgravity, conducting spacewalks, and keeping systems operational over long periods of time—capabilities critical to future missions.

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

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 Shuttle before retirement; and delivery and operability of the systems that support the six crew capability.

FY 2008 Performance Forecast

- In October 2007, NASA launched the Harmony Node 2 module on STS-120. It will serve as a passageway between the U.S. Destiny Laboratory and two modules to be launched in the future: the Japanese Kibo Experiment Module and the European Columbus Laboratory.
- In winter 2008, STS-122 will deliver Columbus, the first European Space Agency (ESA)-supplied ISS module. Columbus will provide additional research space.
- NASA will deliver to the ISS the Kibo pressurized section aboard STS-123 (scheduled for launch in winter 2008) and the Kibo pressurized module and Japanese Remote Manipulator System aboard STS-124 (scheduled for launch in spring 2008). These will be the first major Japanese ISS elements delivered on-orbit. When completed, Kibo will be the largest ISS module, providing both pressurized and unpressurized research facilities.
- NASA, also aboard STS-123, will deliver the Canadian Special Purpose Dexterous Manipulator, or Dextre, a multi-jointed arm that will have greater freedom of mobility than the ISS's Canadarm2 robotic arm.
- In fall 2008, STS-126 will deliver a complement of habitability hardware to enable the six crew capability.

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.

FY04	FY05	FY06	FY 2007
8.4.1 Green	8.1 Green 8.2 Green	2.1 Green	**Green**

With support from Shuttle flights STS-116 (ISS construction mission 12A.1), STS-117 (13A), and STS-118 (13A.1), NASA continued work on the ISS solar array and truss sections, preparing the ISS for arrival of new major elements in FY 2008. In July 2007, astronaut Clay Anderson successfully activated the Oxygen Generation System (OGS), part of the ISS's Environmental Control and Life Support System (ECLSS) located in the Destiny Laboratory. An addition to the Elekron system located in the Russian Zvezda module, the OGS is critical to supporting future six-crewmember operations.

NASA reached an agreement with the International Partners on the final ISS configuration and assembly sequence, setting a path toward assembly completion in FY 2010.

NASA also continued regular logistical resupply using both Shuttle missions and support from Russian Soyuz and Progress missions.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
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.	4ISS3 Green	5ISS3 Green	None	**7ISS1 Green**
Accomplish a minimum of 90% of the on-orbit research objectives as established one month prior to a given increment.	4ISS4 Green	5ISS4 Yellow	6ISS3 Yellow	**7ISS2 Green**
Per the final configuration agreed to by the International Partners, fly the ISS elements and logistics baselined for FY 2007.	4ISS5 Green	5ISS5 Yellow	6ISS1 Green	**7ISS3 Green**

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

FY04	FY05	FY06	FY 2007
None	None	None	**Green**

NASA is on track to support six-crewmember operations in FY 2009. ISS crew successfully activated the OGS (see Outcome 2.1 above). A team at Kennedy Space Center modified Harmony (Node 2) to receive a second treadmill, which will provide needed exercise facilities for a larger crew. Harmony was launched successfully in fall 2007 and is integrated onto the ISS. NASA also is preparing other habitability hardware for launch in FY 2008: the Water Recovery System, a Treadmill with Vibration Isolation System, extra crew quarters, the Waste Collection/Hygiene Compartment, the Total Organic Carbon Analyzer, and galley. NASA also made progress in developing plans for training, crew composition and rotation, and Russian Soyuz launch timetable associated with effectively maintaining and using a six-crewmember complement.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Establish flight-ready status for the urine processing capability (part of the U.S. Regenerative Environmental Control Life Support System).	None	None	None	**7ISS4 Green**
In concert with the International Partners, assure a continuous crew presence on the ISS.	4ISS6 Green	5ISS6 Green	None	**7ISS5 Green**

Efficiency Measures

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Complete all development projects within 110% of the cost and schedule baseline.	4ISS7 Green	5ISS8 Green	6ISS5 Green	**7ISS6 White**
Deliver at least 90% of scheduled operating hours for all operations and research facilities.	None	5ISS9 Green	7ISS6 Green	**7ISS7 Green**

Why NASA rated APG 7ISS6 White: SOMD was not scheduled to complete any development projects in the ISS Theme during FY 2007, so NASA has postponed this Efficiency Measure until a later fiscal year.

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 (86%)	1 (14%)	0	0
15 APGs	11 (73%)	2 (13%)	1 (7%)	1 (7%)

Cost of Performance (in millions)
$1,397

Responsible Mission Directorate

Contributing Theme

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-Sun System Research	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 now 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, take longer to have effects—which spread over large regions, including the entire Earth—that 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 a Bush Administration effort to ensure that benefits derived from oceans and other bodies of water will be available to future generations.

To support these initiatives, NASA and 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

Long-term climate observations remain at risk due to National Polar-orbiting Operational Environmental Satellite System (NPOESS) restructuring. The resulting gaps in systematic observations and/or reduced accuracy and stability in operational future observations may compromise the effectiveness of NASA's Earth Science program performance. Advancement of climate science and its resulting societal benefits require both the new Earth observations provided by advanced instruments pioneered by NASA and high-quality auxiliary measurements from proven instrumentation flown by NOAA on operational missions such as NPOESS and Geostationary Operational Environmental Satellites (GOES). Recent changes to the NOAA operational systems jeopardize the availability of the high quality operational measurements needed for NASA to achieve Sub-goal 3A. If NASA is given the responsibility of replacing these measurements without concomitant resources, the full suite of new and operational measurements will not be achieved and the effectiveness of the NASA Earth Science program will be significantly compromised.

FY 2008 Performance Forecast

NASA has completed concept studies led by NASA Centers for all the Earth Science Decadal Survey (*Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond*, published by the National Academies in 2007) missions and led community science workshops for the four missions described for implementation in the first, most immediate-priority group. As a result, NASA is prepared to implement the Decadal Survey as resources become available.

NASA continues to work with NOAA and the NPOESS program under the guidance of the Office of Science and Technology Policy (OSTP) to develop plans for the mitigation of the impacts of the NPOESS re-structuring. Planning efforts have been successful in identifying viable solutions and the required resources, which might be implemented in FY 2009.

A Senior Review in 2007 evaluated 10 of the 11 operating spacecraft in the Earth Systematic Missions Program to determine mission extensions and resources required for mission operations (Aura, still in its prime mission through July 2010, was the sole exception). Most of the spacecraft already are in their extended mission phase, and are slated to operate through the end of 2009.

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 04	FY 05	FY 06	FY 2007
None	None	3A.1 Green	**Green**

Polar stratospheric clouds (PSCs) play a central role in the springtime depletion of ozone particles over polar regions. These particles spur chemical reactions that release bromine and chlorine from stable compounds found in the atmosphere into chemically reactive forms responsible for ozone destruction. These same chemical reactions store nitrogen, also found in the stable compounds present in PSCs. The PSCs can sediment to lower altitudes, removing nitrogen from higher altitudes and delaying the reformation of these stable compounds—further exacerbating ozone depletion. NASA's Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO), launched in April 2006, can collect PSC data in areas not lit by the Sun, delivering the first routine daily observations across the wintertime Antarctic stratosphere and providing a more accurate view of PSC distribution. In a study published in 2007, scientists stated that CALIPSO observations for the 2006 Antarctic winter and spring provided more accurate PSC representations in global models, which are critical to forecasting the recovery of ozone for a future stratospheric state. This is particularly important for the Arctic, where winter temperatures hover near the threshold where PSCs form, with future stratospheric cooling potentially leading to enhanced cloud formation and substantially greater ozone loss.

A key instrument aboard the Terra and Aqua spacecrafts—the Moderate Resolution Imaging Spectroradiometer (MODIS)—makes measurements of aerosol and cloud properties. Recently, the MODIS science team expanded their data products through a new aerosol algorithm called "Deep Blue," which provides much-improved measurements of aerosols over bright surfaces such as deserts. As a result, MODIS aerosol data products now include large continental areas previously not available. Deep Blue has proven itself to be such an improvement that the U.S. Navy has incorporated this aerosol retrieval algorithm in their operational atmospheric forecasting system.

Scientists using MODIS and other instrument measurements of aerosol properties found apparent increases in aerosol particle size in the vicinity of clouds. They assumed the aerosol size increase was caused by relative humidity gradients

near cloud edges. Radiative transfer (the process of energy transfer in the form of electromagnetic radiation through the atmosphere) modeling of visible light in three-dimensions showed light scattered out from the sides of clouds can scatter off ambient aerosols and cause those aerosols to appear artificially large to satellite remote sensing. Quantifying this effect is important to gain a more certain estimation of aerosol properties and their impact on Earth's radiation/energy budget, the balance of incoming energy from the Sun and out-going long-wave (thermal) and reflected short-wave energy from Earth. For example, the processes associated with the radiation/energy budget keep Earth's overall temperature relatively constant. If the budget becomes unbalanced, such as through increased greenhouse warming caused by aerosols, Earth's global temperature will rise.

FY 2007 Annual Performance Goal	FY04	FY05	FY06	FY 2007
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. Progress will be evaluated by external expert review.	None	None	6ESS7 Green	**7ESS1 Green**

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

FY04	FY05	FY06	FY 2007
None	None	3A.2 Green	**Green**

New NASA research is providing clues about how the seemingly subtle movement of air within and around the eye of hurricanes provides energy to keep this central "powerhouse" functioning. Using data captured from satellites during field experiments, scientists discovered air patterns that changed the way they would predict a storm's strength. The spinning flow of air parcels, or vortices, in the eye can carry warm, moist eye air into the eyewall, the thunderstorms that separate the eye from the rest of the hurricane. This acts as a turbocharger for the hurricane heat engine. The new results improve understanding of the mechanisms that play significant roles in hurricane intensity.

To gain insight into the behavior of Atlantic hurricanes and understand the forces that cause differences in interannual character of these storms, NASA launched a field experiment—the NASA African Monsoon Multidisciplinary Activities (NAMMA)—to study the birth of hurricanes off the African coast. Many of the powerful late-fall storms that take aim at the United States, Gulf Coast, and eastern seaboard are born over Africa. The goal of this field experiment was to fly high-altitude research aircraft into the maw of early cloud disturbances to discover the precise mechanisms by which a storm's spin becomes organized. In addition, scientists gained a better understanding of how the Saharan Air Layer (an intensely dry, warm and sometimes dust-laden layer of the atmosphere that often overlays the cooler, more-humid surface air of the Atlantic Ocean) or dust might curb the development of these clouds into hurricanes. The major NAMMA research topics included the formation and evolution of tropical hurricanes in the eastern and central Atlantic, the composition and structure of the Saharan Air Layer, and whether or not aerosols affect cloud precipitation and influence cyclone development. The study provided improved physical understanding of tropical hurricanes, helping researchers create better computer models of hurricane development and intensification, and thereby producing more skillful forecasts.

FY 2007 Annual Performance Goal	FY04	FY05	FY06	FY 2007
Demonstrate progress in enabling improved predictive capability for weather and extreme weather events. Progress will be evaluated by external expert review.	None	None	6ESS7 Green	**7ESS2 Green**

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

FY04	FY05	FY06	FY 2007
None	None	3A.3 Green	**Green**

NASA research on terrestrial productivity, land cover, and carbon cycling rely on high-quality satellite remote-sensing data products. Validation of these data products thus is critical and provides an important means for characterizing errors and uncertainties in remote-sensing measurements that affect model results. During FY 2007, NASA investigators summarized ongoing global land product validation in a special journal issue. Papers described validation of the major data products that

are used to analyze terrestrial processes, land cover, and carbon cycling, and provided recommendations for the best use of current products while informing the design of future missions.

Scientists working within NASA's Land Cover and Land Use Change Program analyzed changes in carbon stocks in regrowing forests of the U.S. Pacific Northwest and Northwestern Russia. Forests in both regions, which are regrowing after regional disturbances, influence the exchange of greenhouse gases between land and the atmosphere. Significantly different regional, historical trends influence forest ownership and management practices that affect potential carbon storage. Results of this analysis indicate that over the next 50 years, carbon accumulation on lands managed for timber production in both regions will follow historic patterns.

Researchers have hypothesized that warming would lengthen the growing season in northern ecosystems and increase the probability of fire, leading to a positive feedback between warming, fires, carbon loss, and future climate change. A new multi-factor analysis—examining greenhouse gases, aerosols, black carbon deposition on snow and sea ice, and post-fire changes in surface albedo (or reflectivity)—of the long-term effects of a well-characterized northern forest fire indicates that the net radiative forcing may be negative. Radiative forcing is the difference between incoming and outgoing radiation energy in Earth's climate system. When the radiative forcing is negative, the climate system cools. The analysis also showed that multi-decadal increases in surface albedo had a larger impact than the fire-emitted greenhouse gases. This study illustrates the importance of interdisciplinary, multi-factor analysis and the need to examine effects over decades-to-centuries time scales.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
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	None	6ESS7 Green	**7ESS3 Green**
Complete Landsat Data Continuity Mission (LDCM) Confirmation Review.	None	None	None	**7ESS4 White**
Complete Orbiting Carbon Observatory (OCO) Assembly, Test and Launch Operations (ATLO) Readiness Review.	None	None	None	**7ESS6 Yellow**

Why NASA rated APG 7ESS4 White: NASA canceled this APG due to a mandated change in the procurement approach.

Why NASA did not achieve APG 7ESS6: 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.

Plans for achieving 7ESS6: 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.

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.

FY04	FY05	FY6	FY 2007
None	None	3A.4 Yellow	**Green**

NASA's Gravity Recovery and Climate Experiment (GRACE) satellite, launched March 22, 2002, is the first satellite remote-sensing mission to observe groundwater storage variability at regional scales. Groundwater is a vital resource for irrigation and domestic consumption. Without it, agricultural productivity would decrease significantly in many parts of the world, including the central plains of the United States. Researchers routinely use wells to monitor groundwater storage variability at local scales, but that approach is impractical for regional- to continental-scale monitoring. GRACE is unique among remote-sensing satellites in that it relies on observations of Earth's gravity field to infer oceanic and atmospheric circulations and terrestrial water cycling. Using numerical models to separate the contributions to terrestrial water storage variability, including soil moisture and snow, GRACE observations infer groundwater storage variations. Upon analyzing GRACE data, researchers estimated groundwater storage changes in the Mississippi River basin and its four major sub-basins. NASA-supported researchers now are applying their technique to other regions of the world where well observations are unavailable to document water declines.

To ensure the accuracy of data, it is important to constantly assess researchers' ability to measure, monitor, and model various aspects of Earth's water balance (e.g., precipitation, evaporation, soil moisture, snow runoff, atmospheric water content). Estimates of water balance over the past century show variations in the size of various water reservoirs and fluxes. Since water spends a relatively short time in the atmosphere, an annual water balance of the atmosphere should result in a balance of water entering and leaving the atmosphere. However, estimates of water balance quantities over the past century vary enough to suggest that the data collection or modeling method may have been inaccurate. A recent study by NASA-funded researchers evaluated the relative agreement between observation estimates and model estimates. They found that on average, annual estimates of precipitation and evaporation are out of balance. There are inconsistencies between the estimates of the water vapor content of the atmosphere and estimates of precipitation minus evaporation. The study points out that in order to uncover trends in water balance quantities, for example due to climate change, scientists require a two-fold enhancement of their ability to estimate the terms of the water balance and improved quantification of the ocean evaporation.

FY 2007 Annual Performance Goal	FY04	FY05	FY06	FY 2007
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	None	6ESS7 Green	**7ESS5 Green**

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.

FY04	FY05	FY06	FY 2007
None	None	3A.5 Yellow	**Yellow**

Scientists at NASA's Goddard Space Flight Center and the University of Colorado developed an innovative technique for using data from the GRACE satellite to estimate, with unprecedented detail, the growth and shrinkage of major drainage systems in the Greenland and Antarctic ice sheets. In Greenland, these results show significant ice loss in the southeastern section of the ice sheet, and modest losses elsewhere, while the interior has been growing. While the results show that between 2003 and 2005 the ice sheet loss was offset partially by a gain in the interior sheet, they still indicate enhanced ice loss in Greenland since the mid-1990s. These results are consistent with those from altimetry measurements from the Ice Cloud and Land Elevation Satellite (ICESat).

Scientists also showed, using passive microwave satellite data, that winter sea ice extent has significantly accelerated its decline during the last three winters (2005–2007) in a manner consistent with predictions related to greenhouse warming. In the 26 years prior to 2005, the satellite data showed that the sea ice cover in the Northern Hemisphere during winter maximum declined at the rate of approximately two percent per decade, which was modest compared to the nearly 10 percent per decade decline in the extent of the summer sea ice minimum. However, shrinkage appears to have increased significantly in winter 2005, as the ice cover at winter maximum has been consistently low and is about six percent lower than average since then. Such phenomenon is consistent with the expected warming induced by greenhouse gases, which are supposed to be most detectable during dark winter when effects of long-wave radiation are most dominant.

Why NASA did not 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 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.

Plans for achieving 3A.5: 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, 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 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
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	None	6ESS7 Green	**7ESS7 Green**
Complete Glory mission Pre-Ship Review.	None	None	None	**7ESS8 Yellow**
Complete Ocean Surface Topography Mission (OSTM) Critical Design Review (CDR).	None	None	None	**7ESS9 Green**

Why NASA did not achieve APG 7ESS8: 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.

Plans for achieving APG 7ESS8: 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.

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

FY04	FY05	FY06	FY 2007
None	None	3A.6 Green	**Green**

Accurate global topography has been the goal of explorers and surveyors for millennia because of its importance to understanding the environment and enabling societal development. The Shuttle Radar Topography Mission (SRTM) provided the first uniform high-resolution map of global topography with only 10 days of on-orbit measurement in February 2000. Although NASA released all SRTM data within two years of the SRTM mission, studies continue to characterize and improve the SRTM digital topographic data. In FY 2007, NASA-supported researchers produced a final report on the mission, its technology, its operations, the error distribution, processing, and some of the many and varied science applications.

The Aceh Earthquake and subsequent tsunami exposed the shortcomings of estimating earthquake magnitude and, therefore, tsunami potential from seismic data. Rapid assessment of conditions that could produce a tsunami is especially important for coastal communities near an earthquake epicenter because of short time between the earthquake and the subsequent tsunami. NASA-supported Global Positioning System (GPS) networks could be used in real time to estimate tsunami potential and provide input to tsunami models. NASA is moving ahead with further testing of the concept of regional GPS networks through collaborative efforts with EarthScope, state-operated networks, and international partners.

FY 2007 Annual Performance Goal	FY04	FY05	FY06	FY 2007
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	None	6ESS7 Green	**7ESS10 Green**

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

FY 04	FY 05	FY 06	FY 2007
None	None	3A.7 Green	**Green**

The Applied Sciences Program conducts projects to demonstrate, prototype, and validate the use of Earth science products in decision making, benefiting areas like public health, aviation, water management, and disaster management. Through reports that document the improvement in decision making enabled by the use of Earth science, the program enables the routine, sustained use of NASA data products. The program is developing a new, regionally-based activity to focus specifically on the Gulf of Mexico. In addition, the program is developing a new strategic plan, which will address emerging issues such as decision-support needs for climate change and the incorporation of social and economic sciences into applications of satellite observations.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
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	None	**7ESS11 Green**
Complete five studies on plans to transition the results of NASA research and development, including scientific spacecraft and instruments, models, and research results, with potential to improve future operational systems of partner agencies.	None	None	None	**7ESS12 Green**

Efficiency Measures

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Deliver at least 90% of scheduled operating hours for all operations and research facilities. (This APG is repeated under Sub-goal 3B.)	None	5SEC14 Yellow	None	**7ESS22 Green**
Peer-review and competitively award at least 80%, by budget, of research projects. (This APG is repeated under Sub-goal 3B.)	4ESA8 Green	5SEC16 Green	None	**7ESS23 Green**
Reduce time within which 80% of NRA research grants are awarded, from proposal due date to selection, by 5% per year, with a goal of 130 days.	None	None	None	**7ESS24 Red**

Why NASA did not achieve Efficiency Measure 7ESS24: 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).

Plans for achieving 7ESS24: 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.

Sub goal 3B

Understand the Sun and its effect on Earth and the solar system.

	Green	Yellow	Red	White
3 Outcomes	3 (100%)	0	0	0
11 APGs	8 (73%)	2 (18%)	1 (9%)	0

Cost of Performance (in millions)
$964

Responsible Mission Directorate

Contributing Theme

Theme Description

The Earth–Sun System Theme conducts research and technology development to advance Earth observations from space, improve understanding of the Earth system, and demonstrate new technologies for future operational systems. It also explores the Sun's connection with, and effects on, the solar system to better understand Earth and Sun as an integrated system, protect technologies on Earth, and safeguard human space explorers.

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 Estimate. Earth Science now 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 (CMEs) can change drastically solar radiation emissions over the course of a single second. All of the solar system's classical nine planets orbit within the outer layers of the Sun's atmosphere, and some planetary bodies, like Earth, have an atmosphere and magnetic field that interacts with 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 using a group of spacecraft that form an extended network of sensors that allow the investigation of 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 heliophysics will provide the information needed to develop early warning systems and technologies that will protect astronauts, spacecraft, and the systems that support both from hazardous space radiation.

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 (Delta IV, 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 previous concern regarding the aging set of Heliophysics spacecraft has been mitigated for some kinds of observations by the launches of Solar–B (Hinode), the Solar TErrestrial RElations Observatory (STEREO), the Time History of Events and Macroscale Interactions during Substorms (THEMIS) spacecraft, and the Aeronomy of Ice in the Mesosphere (AIM) spacecraft in 2006–2007. Additionally, the Interstellar Boundary Explorer (IBEX) mission is scheduled to launch in 2008. It has passed its Critical Design and Mission Operations Reviews, and is currently undergoing Integration and Testing (I&T). The Solar Dynamics Observatory (SDO) also is planned for launch in 2008. All major SDO instrumentation has been delivered for integration. Progress on mesosphere-ionosphere-thermosphere science goals remains to be addressed.

FY 2008 Performance Forecast

- The Heliophysics Theme will conduct a Senior Review in spring 2008 to evaluate the scientific merit of its suite of operating missions in order to determine funding profiles for FY 2009 and beyond.
- Heliophysics anticipates completion of the research phase for the Polar mission, which will bring its operational phase to an end in spring 2008. Launched in 1996, the Polar mission imaged aurorae and measured the entry of plasma into the polar magnetosphere and the geomagnetic tail, the flow of plasma to and from the ionosphere, and the deposition of particle energy in the ionosphere and upper atmosphere.
- The Heliophysics Research Program will open competition for new research awards, resulting in about 70 new awards.
- NASA will complete development of SDO, working towards launch in December 2008. SDO will image the Sun to study how the solar magnetic field is structured and how its energy is converted and released into the heliosphere in the forms of solar wind, energetic particles, and variations in solar irradiance.
- Heliophysics will continue formulation for the Magnetospheric Multiscale (MMS) mission based on replanning conducted in FY 2007 (see below). 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 continue formulation for the Radiation Belt Storm Probes (RBSP) mission. RBSP is a two-spacecraft mission to investigate how populations of charged particles in the Earth's magnetosphere are formed or changed in response to the variable inputs of energy from the Sun.
- Heliophysics will also initiate Phase A on a solar probe mission and will initiate Phase B on the Balloon Array for Radiation-belt Relativistic Electron Losses (BARREL) Geospace Mission of Opportunity balloon campaign.
- NASA will conduct I&T on the IBEX mission in preparation for a summer 2008 launch. IBEX will study the properties of the interstellar boundaries that separate the heliosphere—the immense "bubble" containing the solar system, the solar wind, and the entire solar magnetic field—from the interstellar medium that exists beyond the edge of the solar system.

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.

FY04	FY05	FY06	FY 2007
5.6.1 Green	15.4 Green	3B.1 Green	**Green**
5.6.2 Blue	15.5 Green		
5.6.3 Green	15.6 Green		
5.7.1 Green	15.7 Green		
5.7.2 Green	15.8 Green		

NASA-funded scientists answered key questions about how the interaction of magnetic fields produce the explosive releases of energy seen in solar flares, storms in Earth's magnetosphere, and many other powerful cosmic events. This process, called "magnetic reconnection," involves the merging of magnetic fields from disparate sources. Magnetic reconnection in Earth's magnetosphere is one of the mechanisms responsible for the aurorae, releasing in minutes energy that has been stored in the magnetic field over a period of days to months. The Heliophysics Great Observatory missions probed several reconnection sites during the past year, encountering the energetic jetting plasmas produced by reconnection on several occasions and measuring the boundaries of the structures themselves. Scientists confirmed that the rate at which the magnetic fields in geospace are able to reconnect is related to the orientation and relative strength of the participating magnetic and electric fields, and the rate was observed to increase as the pressure of the solar wind increases. Scientists found conclusive evidence for prolonged (at least five hours) reconnection in the solar wind. Spacecraft observed reconnection jets on the Sun at open field regions at the solar poles with much (approximately 40 times) higher frequency than had been previously observed. These jets may contribute to the high-speed solar wind. Scientists found an explanation as to why up to half of the energy released during solar flares is in the form of energetic electrons; the electrons are able to preferentially gain speed (kinetic energy) by repeatedly reflecting, or bouncing, off of the ends of contracting "magnetic islands" that form as the magnetic field lines reconnect. Most importantly, the Cluster mission observed the

electron diffusion region where electrons become unmagnetized, allowing the reconnection to proceed and grow to be 10 times as large as previously thought.

NASA- and National Science Foundation-supported scientists discovered what shapes and powers the chromosphere, a thin region of the Sun's atmosphere. The chromosphere is a significant source of variations in the Sun's ultraviolet radiation that may contribute to climate change on Earth. The chromosphere is sandwiched between the cooler solar surface and the considerably hotter outer atmosphere, called the corona. Why the Sun's chromosphere is much hotter than the visible surface of the star has been a puzzle for decades. In the past, scientists proposed sound waves and the ever-changing solar magnetic field as potential drivers of this counter-intuitive temperature structure. The new results show that both have a part to play, offering a significant leap in the understanding of one of the Sun's remaining great mysteries. By analyzing the motions of structures within the solar atmosphere, the scientists observed that near strong knots of magnetic field, sound waves from the interior of the Sun leak out and propagate upward into the solar atmosphere. The magnetic field knots release wave energy from the solar interior, permitting the sound waves to travel through thin fountains upward and into the solar chromosphere. These magnetic fountains release a lot more energy into the chromosphere than researchers had previously thought, resulting in higher atmospheric temperature.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
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.	4SEC11 Green	5SEC9 Blue	6ESS11 Green	**7ESS13 Green**
	None	None	6ESS12 Green	
	4SEC14 Green	5SEC12 Blue	6ESS14 Green	
	4SEC15 Green	5SEC13 Green	6ESS15 Green	
Deliver Solar Dynamics Observatory (SDO) instruments to spacecraft for integration.	None	5SEC2 Green	6ESS17 Green	**7ESS14 Yellow**
Complete Magnetospheric MultiScale (MMS) instrument suite Preliminary Design Review (PDR).	None	None	None	**7ESS15 Red**
Award Geospace Missions Radiation Belt Mapper [now named Radiation Belt Storm Probes (RBSP)] Phase A instrument contracts.	None	5SEC4 White	6ESS18 Green	**7ESS16 Green**
Successfully launch Time History of Events and Macroscale Interactions during Substorms (THEMIS) spacecraft.	None	5SEC3 Green	None	**7ESS17 Green**
Release Explorer Program Announcement of Opportunity (AO).	None	None	None	**7ESS18 Green**

Why NASA did not achieve APG 7ESS14: 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.

Plans for achieving 7ESS14: 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.

Why NASA did not achieve APG 7ESS15: NASA replanned the MMS mission to resolve the discrepancy between mission requirements and the available budget. Progress on mission milestones was delayed during the the replanned schedule, but this replanning allowed the mission to go forward intact, without major performance degradation.

Plans for achieving 7ESS15: The MMS was approved for transition to Phase B in November 2007. The MMS instrument suite PDR is scheduled for completion in FY 2009.

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.

FY04	FY05	FY06	FY 2007
1.3.2 Green	15.2 Green	3B.2 Green	**Green**
1.3.3 Green	15.3 Green		

NASA scientists revealed new information on the source and generation mechanisms for the electromagnetic waves responsible for the acceleration of particles to high energies near Earth. The waves are radio signals with narrow-band tones that rise in frequency over a period of a few seconds. Called the "dawn chorus," the wave signal resembles that of birds heard at a distance. Although the signals had been detected for several decades, scientists knew very little about the actual source of the dawn chorus and how the waves themselves were created. For example, a "chorus" is most often detected on Earth's morning side, but it was not clear why. By measuring tiny differences in the arrival time of chorus signals at multiple spacecraft, scientists were able to deduce that the source region is quite compact and located near the magnetic equator at distances beyond 15,000 miles. Furthermore, this region is very likely to be the source for a large class of other, but similar, wave phenomena that propagate downward to be observed as aurorae. These studies enable scientists to learn more about how radio waves propagate in an electrified gas, which will be helpful to future applications of radio technology.

The Cluster mission observed superheated bubbles of gas growing and popping at the location where the solar wind meets Earth's magnetic field. The mission scientists theorized that these bubbles in space may collectively form Earth's bow shock, which is found where the solar wind rams into Earth's magnetic field, similar to the bow wave in front of a ship. This bow shock slows down and deflects the bulk of the incoming solar wind around Earth's magnetic field. Previously, scientists did not know how charged particles in space could be capable of creating such a bow shock. Using Cluster data, the scientists found that the bubbles, which may be caused by the energy that piles up at the bow shock, pushed particles from the solar wind to the side, effectively stopping the particles' movement towards Earth. Understanding how Earth's bow shock forms and dissipates energy will help scientists better understand certain aspects of space weather in the nearby space environment.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Deliver Solar Dynamics Observatory (SDO) instruments to spacecraft for integration.	None	5SEC2 Green	6ESS17 Green	**7ESS14 Yellow**
Complete Magnetospheric MultiScale (MMS) instrument suite Preliminary Design Review (PDR).	None	None	None	**7ESS15 Red**
Award Geospace Missions Radiation Belt Mapper Phase A instrument contracts.	None	5SEC4 White	6ESS18 Green	**7ESS16 Green**
Release Explorer Program Announcement of Opportunity (AO).	None	None	None	**7ESS18 Green**
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.	4SEC10 Blue 4SEC13 Green	5SEC8 Green 5SEC11 Green	6ESS10 Green 6ESS13 Green	**7ESS19 Green**

Why NASA did not achieve APG 7ESS14: The delivery of two of the three SDO instruments was delayed due to unanticipated technical difficulties in the data interfaces between the HMI and the 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.

Plans for achieving 7ESS14: 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.

Why NASA did not achieve APG 7ESS15: 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.

Plans for achieving 7ESS15: NASA approved MMS for transition to Phase B in November 2007. The MMS instrument suite PDR is scheduled for completion in FY 2009.

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.

FY04	FY05	FY06	FY 2007
1.3.1 Green	15.1 Green	3B.3 Green	**Green**

A new space weather forecast method, based on data from the Solar and Heliospheric Observatory (SOHO) spacecraft, permits - for the first time - up to an hour of warning prior to the arrival of the most dangerous particles of a solar storm at Earth. According to radiation safety experts at Johnson Space Center, once verified, the technique may help NASA reduce the exposure to radiation by more than 20 percent compared to current methods and may allow astronauts to venture farther from shelter. Solar storms consist of electrons and ions, the latter of which pose a grave danger to space-borne electronics and to humans outside Earth's protective magnetic field. Electrons arrive first, signaling the later arrival and intensity of the ions. Previously, there was no adequate method to predict when and at what intensities the ions arrive.

In a parallel development, the Wind mission showed that the Sun's radio waves also can be used as an indicator of an approaching solar storm. NASA scientists discovered that coronal mass ejections capable of producing radiation storms "scream" in radio waves as they slam through the solar wind. Since the radio signal moves at the speed of light while the particles that will produce the storm follow behind, the signal provides an early warning that allows astronauts and satellite operators to prepare for the impending storm. CMEs can bring intense radiation storms that can damage satellites and cause short- and long-term health effects in unprotected astronauts.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Deliver Solar Dynamics Observatory (SDO) instruments to spacecraft for integration.	None	5SEC2 Green	6ESS17 Green	**7ESS14 Yellow**
Award Geospace Missions Radiation Belt Mapper Phase A instrument contracts.	None	5SEC4 White	6ESS18 Green	**7ESS16 Green**
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.	4SEC8 Green 4SEC9 Green	5SEC6 Green 5SEC7 Green	6ESS8 Green 6ESS9 Green	**7ESS20 Green**

Why NASA did not achieve APG 7ESS14: The delivery of two of the three SDO instruments was delayed due to unanticipated difficulties in the data interfaces between the HMI and the AIA and the spacecraft's command and data handling system. Both instruments use the new technology of 4,000 x 4,000 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.

Plans for achieving 7ESS14: The HMI instrument was delivered on November 2007. The AIA instruments were delivered in December 2007.

Efficiency Measures

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Complete all development projects within 110% of the cost and schedule baseline.	4ESS1 Green	5SEC14 Red	6ESS24 Red	**7ESS21 Yellow**
Deliver at least 90% of scheduled operating hours for all operations and research facilities. (This APG is repeated under Sub-goal 3A.)	None	5SEC15 Yellow	6ESS25 Green	**7ESS22 Green**
Peer-review and competitively award at least 80%, by budget, of research projects. (This APG is repeated under Sub-goal 3A.)	4ESA8 Green	5SEC16 Green	6ESS26 Green	**7ESS23 Green**

Why NASA did not achieve APG 7ESS21: 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.

Plans for achieving 7ESS21: 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.

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 (100%)	0	0	0
13 APGs	10 (77%)	0	2 (15%)	1 (8%)

Cost of Performance (in millions)
$1,325

Responsible Mission Directorate

Contributing Theme

Theme Description

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

PART Assessment Rating						
Theme	**Last Year Assessed**	**Overall Rating**	**Program Purpose and Design**	**Strategic Planning**	**Program Management**	**Program Results/ Accountability**
Solar System Exploration	2006	Effective	100%	100%	91%	74%

To achieve Sub-goal 3C, the Solar System Exploration (now 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 how terrestrial bodies originated, evolved, and their habitability. 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 as possible (perhaps years).

Risks to Achieving Sub-goal 3C

Of primary cost concern is the reduction in ELV launch 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 (Delta IV, 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, including the development of dual payload launch capability and alternate launch providers for mid-range planetary payloads.

FY 2008 Performance Forecast

- Phoenix is scheduled to land in Mars's northern arctic plain on May 25, 2008. Using a suite of instruments and a robotic arm, Phoenix will sample the atmosphere, take stereo images, and analyze the Martian soil and ice sitting just below the top soil layer. The goal of the mission is to help determine whether life ever arose on Mars, characterize the atmosphere and geology, and collect information important to future human exploration.
- The Mars Science Laboratory (MSL) will begin assembly, test, and launch operations in early 2008, in preparation for its launch readiness date in September 2009. The MSL rover will collect samples from Martian soil and rocks to search for the chemical building blocks of life and determine the planet's habitability.
- The MESSENGER spacecraft will complete the first of three flybys of Mercury in January 2008. In 2011, MESSENGER will become the first spacecraft to orbit Mercury, a planet of extremes that holds vital clues to how the solar system formed and evolved.
- Heading towards the outer reaches of the solar system, New Horizons will pass the orbit of Saturn in summer 2008 on its long trek to the double planet Pluto and its moon Charon. Pluto is part of the icy Kuiper Belt, a zone of planetary embryos and debris left over from when the solar system was forming more than four billion years ago.
- The Juno mission will complete its Preliminary Design Review (PDR)/Non-Advocate Review and enter its implementation phase, with the target of reaching launch readiness in summer 2011. Juno will study Jupiter's interior structure and dynamics, atmospheric composition, and magnetosphere to provide a better understanding of this archetypal gas giant and the origin of Earth's solar system and solar systems around other stars.
- Two spacecraft that have completed their missions will be re-tasked as Discovery Missions of Opportunity. The Deep Impact Extended Investigation of Comets (DIXI) will use the existing Deep Impact spacecraft—which sent an impactor into comet Tempel 1 on July 4, 2005—to conduct a flyby of comet Tempel 2 in October 2010. Along the way, the spacecraft will observe planets orbiting several nearby bright stars as part of the Extrasolar Planet Observation and Characterization (EPOCH) investigation. The Stardust spacecraft—which returned a capsule containing samples of comet Wild 2 in January 2006—will conduct a flyby of Tempel 1 as part of the New Exploration of Tempel 1 (NExT) investigation. The spacecraft will study changes to the comet nucleus since Deep Impact observed it in 2005. Stardust will reach Tempel 1 in 2011.

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

<table>
<tr><th>FY04</th><th>FY05</th><th>FY06</th><th>FY 2007</th></tr>
<tr><td>5.1.2
Green</td><td>3.2
Green</td><td rowspan="2">3C.1
Green</td><td rowspan="2">Green</td></tr>
<tr><td>5.1.3
Green</td><td>3.3
Green</td></tr>
</table>

Using precise radar measurements taken from the ground and data from NASA's Mariner 10 spacecraft (which operated from 1973 through 1975), researchers determined that tiny Mercury likely has a molten core. Because Mercury is so small, most scientists expected its core to have cooled and solidified long ago and that its magnetic field may have been "frozen" into the planet when the core cooled. Researchers found that the mantle is separated from a core that is at least partially molten. The state of the planet's core depends greatly on the core's chemical composition, and that composition can provide important clues about the processes involved in planet formation. NASA's MESSENGER spacecraft, which completed its second Venus flyby in June 2007 as it journeys to the innermost planet, will collect much more detailed data on Mercury.

Despite decades of research, scientists have not calculated a precise rotation period for Saturn. Previously, they determined the rotation period using Voyager and Cassini magnetometer data. While these data agreed, they were measuring the rotation of Saturn's magnetosphere. Using gravitational data from NASA's Cassini spacecraft, researchers determined a new rotation period that is tied more directly to the mass of the planet. The new period of 10 hours 32 minutes is less than the previously determined period of 10 hours 39 minutes. While this difference seems small, it has important implications for understanding Saturn's atmosphere: the speed of the planet's surface winds, which had seemed anomalous using the previous rotation period calculation, are reduced, and the model for Saturn's atmosphere now fits more closely with models for other planets.

Using Mars Reconnaissance Observer (MRO) observations, researchers delineated the locations of phyllosilicates, the alteration products of minerals sustaining contact with water. The data show that these minerals are widespread in the highlands of Mars, but restricted to the most ancient areas dating to the Noachian era, the oldest of three periods during which the Mars surface formed. The research provides new and important information about early Mars, the interaction of water with the crust, and consequences of the evolution of the planet's interior.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
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.	4SSE12 Yellow	5SSE7 Green	6SSE7 Green	**7SSE1 Green**
Perform MErcury Surface, Space ENvironment, GEochemistry, and Ranging mission (MESSENGER) second Venus flyby.	None	None	6SSE28 White	**7SSE2 Green**
Complete Juno Preliminary Design Review (PDR).	None	None	None	**7SSE3 White**

Why NASA rated APG 7SSE3 White: In 2006, NASA postponed the Juno PDR after altering the New Frontiers Program budget and shifting the Juno launch date to a 2010–2011 timeframe. Because NASA did not issue a revised FY 2007 Performance Plan with the FY 2008 Budget Estimates and, therefore, was unable to revise this APG before the beginning of the FY 2007 performance year, management chose to cancel the measure. The Juno PDR is scheduled for May 2008.

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.

FY04	FY05	FY06	FY 2007
5.2.3 Green	3.7 Green	3C.2 Green	**Green**
5.2.4 Green	3.8 Green		

Although research has not revealed complex organics on Mars, data gathered in 2003 found methane, a basic organic compound. Since most of the methane in Earth's atmosphere is generated by living organisms, researchers hoped that the finding indicated the presence of bacteria living in Mars' ice. In an assessment completed in FY 2007, researchers found the most probable source of methane is a process called low-temperature serpentinization, observed on Earth's ocean floor, where liquid water chemically alters basalt to produce methane. Low-temperature serpentinization occurring in liquid water reservoirs under Mars' surface would produce minerals called serpentines, as well as approximately 200,000 tons of methane every year. The researchers also found that one of the least likely scenarios for the current presence of Martian methane is delivery by a comet or meteorite.

Using observations by the Cassini spacecraft of Saturn's moon Enceladus, scientists detected geysers containing water-vapor and the decomposition products of water, as well as small amounts of molecular nitrogen and methane. This suggests that the interior of Enceladus is warm enough to contain liquid water and that is, or once was, favorable to catalytic chemistry that would permit the synthesis of complex organic compounds. This makes Enceladus an exciting subject for further research to discover if this moon could possibly be hospitable to primitive life and to reveal how such a small, icy body could have a warm core.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
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.	4SSE17 Green	5SSE12 Green	6SSE12 Green	**7SSE4 Green**
	4SSE18 Green	5SSE13 Green	6SSE13 Green	
	4SSE19 Green	5SSE14 Green	6SSE14 Green	
	4MEP9 Green	5MEP7 Green	6SSE15 Green	
	4MEP10 Blue	5MEP8 Blue	6SSE16 Green	
	4MEP11 Blue	5MEP9 Green	6SSE17 Green	
	4MEP12 Green	5MEP10 Green	6SSE18 Green	
	4MEP13 Green	5MEP11 Yellow	6SSE19 Yellow	

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Complete 2009 Mars Science Laboratory Critical Design Review (CDR).	None	5MEP4 Yellow	6SSE25 Green	**7SSE5 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.

FY04	FY05	FY06	FY 2007
5.3.1 Green	2.1 Green	3C.3 Green	**Green**
5.3.2 Blue	2.2 Green		
5.3.3 Blue	2.3 Green		
5.4.1 Green	2.5 Green		
5.4.2 Green	2.6 Green		
5.2.2 Green	3.6 Green		

Several icy moons in the outer solar system possess oceans beneath an ice shell that could harbor life. A new study using data from the Cassini spacecraft suggests that tiny Enceladus, a moon of Saturn, possesses such an ocean. The south pole of Enceladus is warmer and is the site of geysers and fractures. Cassini observations showed that fractures along the surface move backwards and forwards, generating heat from friction. These motions come from Enceladus being squeezed and stretched by Saturn's gravitational field as the moon orbits. However, the motions are too small to explain the observed heat if Enceladus were solid throughout, suggesting that Enceladus has an ocean beneath the surface. If the geysers are in contact with the ocean, a future mission could sample material to look for signs of life simply by flying through a geyser plume (see Outcome 3C.4 for more about chemical compounds found on Enceladus).

Ongoing MRO mapping and analysis of sedimentary deposits in Holden crater on Mars found well-bedded deposits emplaced during two distinct wet intervals during the Noachian era, the oldest of three periods during which Mars's surface formed. During the first of these wet intervals, there was a lake in the crater that included the deposition of phyllosilicates. The second interval was shorter lived and related to flooding occurring when water impounded in the nearby Uzboi Vallis breached the crater rim and drained into the Holden crater. Access to these deposits, perhaps during a future landed mission, could yield important information about the conditions within these ancient lake environments and whether they may have been habitable.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
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.	4MEP14 Green	5MEP12 Green	6SSE20 Yellow	**7SSE6 Green**
Successfully launch Phoenix 2007 spacecraft.	None	None	None	**7SSE7 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.

FY04	FY05	FY06	FY 2007
5.5.1 Blue	2.7 Green	3C.4 Green	**Green**
1.4.1 Green	3.9 Green		
1.4.2 Green	3.10 Green		

NASA's Near Earth Object Observation Program conducts surveys to identify and characterize potentially hazardous objects, like comets and asteroids, coming within Earth's vicinity. External experts estimated that there are approximately 1,100 near-Earth objects of at least one kilometer in size. In 2006, NASA commissioned a study by external experts to reexamine this population estimate based on the distribution of objects found. The revised estimate, completed in FY 2007, indicates that this population may be closer to 940. To date, researchers have identified 788 near-Earth objects larger than one kilometer. Based on the revised estimate, researchers have identified about 84 percent of near-Earth objects larger than one kilometer, placing NASA within six percent of achieving the goal of finding 90 percent of these objects by December 2008.

The Mars Global Surveyor, which launched in 1996 and went silent in November 2006, provided a record of newly formed impact craters on the surface of Mars over seven years. NASA is using this record, the first measurement of actual impact rate on Mars, to validate that model predictions are accurate to within a factor of two of the measurements. NASA uses these model predictions to help identify safe landing sites for robotic and human missions to the Red Planet.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
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.	4SSE10 Green	5SSE5 Green	6SSE5 Green	**7SSE8 Green**
	4MEP15 Blue	5MEP13 Green	6SSE21 Green	
	4MEP16 Blue	5MEP14 Yellow	6SSE22 Green	
Begin Mars Reconnaissance Orbiter (MRO) primary science phase.	None	5MEP2 Green	6SSE23 Green	**7SSE9 Green**

Efficiency Measures

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Complete all development projects within 110% of the cost and schedule baseline.	4SSE1 Yellow	5SSE15 Yellow	6SSE29 Red	**7SSE10 Red**
Deliver at least 90% of scheduled operating hours for all operations and research facilities.	None	5SSE16 Green	6SSE30 Green	**7SSE11 Green**
Peer-review and competitively award at least 80%, by budget, of research projects.	4SSE2 Green	5SSE17 Green	6SSE31 Green	**7SSE12 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	6SSE32 Green	**7SSE13 Red**

Why NASA did not achieve APG 7SSE10: 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.

Plans for achieving 7SSE10: 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.

Why NASA did not achieve APG 7SSE13: 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.

Plans for achieving 7SSE13: 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.

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	3 (75%)	1 (25%)	0	0
16 APGs	14 (88%)	1 (6%)	1 (6%)	0

Cost of Performance (in millions)
$1,467

Responsible Mission Directorate

Contributing Theme

Theme Description

The Universe 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, and search for Earth-like planets beyond the solar system. The Theme also seeks to understand the conditions that support life.

PART Assessment Rating

Theme	Last Year Assessed	Overall Rating	Program Purpose and Design	Strategic Planning	Program Management	Program Results/ Accountability
Astrophysics (formerly the Universe)	2007	Adequate	100%	100%	75%	47%

Through Sub-goal 3D, the Universe (now 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 power and propulsion systems. Some of these technologies find their way into the commercial and defense sectors.

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

Risks to Achieving Sub-goal 3D

For 2008, the launch of the Gamma-ray Large Area Space Telescope (GLAST) mission, successful completion of Hubble Servicing Mission #4, and successful completion of the Preliminary Design Review for the James Webb Space Telescope are all critical milestones and must be reached for a successful year. The Hubble Servicing Mission launch date is beyond the Theme's ability to control, but delays could result in cost impacts to the budget.

Maintaining cost and schedule on the Kepler and Wide-field Infrared Survey Explorer (WISE) missions, each scheduled for a 2009 launch, also is critical. SMD continues to monitor the projects' performance to ensure adherence to plans.

Finally, the Astrophysics Theme must release an announcement of opportunity for a Dark Energy Mission and begin mission formulation. The interagency and potentially international collaborative aspects of this mission add schedule risk to the initiation of mission formulation. Partners must agree on the nature of the announcement of opportunity and the

incorporated roles and responsibilities of the partners. SMD is committed to managing the early study phases for a Dark Energy Mission to ensure a mission architecture consistent with available resources.

FY 2008 Performance Forecast

- The missions managed by the Astrophysics Research Program—including Chandra, Spitzer, Swift, and the Wilkinson Microwave Anisotropy Probe (WMAP)—will continue high-quality astrophysics research consistent with NASA's goals.
- The GLAST launch is planned for mid-2008. After two months of on-orbit checkout, the mission will begin science operations. GLAST will help scientists study the most energetic and exotic phenomena, including pulsars and black holes, to provide insight into the birth and early evolution of the universe.
- The Kepler spacecraft will undergo Integration and Testing, preparing it for launch in fall 2008. Kepler will be the first spacecraft designed to search for Earth-like planets that are up to 600 times less massive than the Jupiter-like gas giants found by other telescopes.
- The James Webb Space Telescope (JWST) will undergo Preliminary Design Review (PDR)/Non-Advocate Review in spring 2008. Upon successful completion, the program will transition from formulation to development. JWST is a next-generation, space-based, infrared observatory that will take over where Spitzer and the Hubble Space Telescope leave off.
- Based on recommendations from the National Research Council, NASA is restructuring the Beyond Einstein Program. The program will begin formulation of the Joint Dark Energy Mission (JDEM), while other mission options remain in technology development.
- The Herschel and Planck missions will be launched together by the European Space Agency in 2008. Herschel will study the formation and evolution of stars and galaxies in the early universe, and Planck will characterize radiation from the cosmic microwave background.
- Flight testing will continue on the Stratospheric Observatory for Infrared Astronomy (SOFIA), an astronomical telescope installed in a 747 aircraft. The program partners also will continue to develop critical observatory sub-systems and instruments.

Outcome 3D.1: Discover the origin, structure, evolution, and destiny of the universe, and search for Earth-like planets.

<table>
<tr><th>FY04</th><th>FY05</th><th>FY06</th><th>FY 2007</th></tr>
<tr><td>5.10.1
Green</td><td>5.1
Green</td><td rowspan="4">3D.1
Green</td><td rowspan="4">Green</td></tr>
<tr><td>5.11.1
Green</td><td>5.4
Green</td></tr>
<tr><td>5.11.2
Green</td><td>5.5
Green</td></tr>
<tr><td>5.11.3
Green</td><td>5.6
Green</td></tr>
</table>

During FY 2007, scientists released findings supporting the existence of dark matter and that the Newtonian gravity familiar on Earth and in the solar system also works on the huge scales of galaxy clusters. Some scientists have proposed alternative theories for gravity where it is stronger on intergalactic scales than predicted by Newton and Einstein, removing the need for dark matter. In August 2006, however, researchers released findings from observations by Chandra and other telescopes of a tremendous collision of two large clusters of galaxies that cannot be explained by alternate theories. The hot gas (normal matter) in the collision was slowed by a drag force while the dark matter, which does not interact directly with itself or the gas through gravity, was not slowed. This produced the separation of the dark and normal matter seen in the data. If hot gas was the most massive component in the clusters, as proposed by alternative gravity theories, the data would not have shown such a separation. In May 2007, astronomers using Hubble discovered a ghostly ring of dark matter that formed during a collision of two other massive galaxy clusters. Computer simulations of galaxy cluster collisions show that when two clusters smash together, the dark matter falls to the center of the combined clusters and sloshes back out. As the dark matter moves outward, it begins to slow down under the pull of gravity and pile up, like cars bunched up on a freeway. Although scientists cannot see dark matter, they can infer its existence in galaxy clusters by observing how its gravity bends the light of more distant background galaxies. The dark matter pile up looks like concentric ripples created when a stone is dropped in water.

Using the new Japanese Suzaku satellite, NASA scientists and their international partners collected a startling new set of black hole observations, revealing details of twisted space and warped time never before seen with such precision. The observations clocked the speed of a black hole's spin rate and measured the angle at which matter pours into the void. They also provided evidence for a wall of X-ray light pulled back and flattened by gravity. The findings rely on a special feature in the light emitted close to the black hole, called the "broad iron K line," once doubted by some scientists because of poor resolution in earlier observations but now unambiguously revealed as a true measure of a black hole's crushing gravitational force. Researchers can use this technique in future X-ray missions.

Scientists using Hubble discovered that dark energy is not a new constituent of space, but rather has been present for most of the universe's history. Dark energy is a mysterious repulsive force that causes the universe to expand at an increasing rate. Scientists found that dark energy was already boosting the expansion rate of the universe as long ago as nine billion years. This picture of dark energy is consistent with Einstein's prediction that a repulsive form of gravity emanates from empty space. Data from Hubble provide supporting evidence into the nature of dark energy and help scientists begin ruling out some competing explanations that predict that the strength of dark energy changes over time.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
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.	4SEU9 Green 4SEU10 Green 4SEU11 Blue 4SEU12 Green 4SEU13 Green 4SEU14 Green 4SEU16 Green	5SEU4 Green 5SEU5 Blue 5SEU6 Green 5SEU7 Green 5SEU8 Yellow 5SEU9 Blue 5SEU11 Blue	6UNIV8 Green 6UNIV9 Green 6UNIV10 Green 6UNIV11 Green 6UNIV12 Green 6UNIV13 Green 6NIV15 Green	**7UNIV1 Green**
Complete Gamma-ray Large Area Space Telescope (GLAST) Operations Readiness Review (ORR).	None	5SEU1 Yellow	6UNIV19 Yellow	**7UNIV2 Yellow**
Complete Hubble Space Telescope Servicing Mission 4 (SM4) Test Readiness Review.	None	None	None	**7UNIV3 Green**
Complete James Webb Space Telescope (JWST) Integrated Science Instrument Module (ISIM) Preliminary Design Review (PDR).	None	None	6UNIV20 Red	**7UNIV4 Green**

Why NASA did not achieve APG 7UNIV2: 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.

Plans for achieving 7UNIV2: 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.

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.

FY04	FY05	FY06	FY 2007
5.8.1 Blue	4.1 Green	3D.2 Yellow	**Green**

The brightest stellar explosion ever recorded may be a long-sought new type of supernova, according to observations by NASA's Chandra X-ray Observatory and ground-based optical telescopes. The discovery of the supernova, known as SN 2006gy, provides evidence that the death of such massive stars is fundamentally different from theoretical predictions. Supernovas usually occur when massive stars exhaust their fuel and collapse under their own gravity. In the case of SN 2006gy, astronomers think that the core of the massive star produced so much gamma ray radiation that some of the energy from the radiation converted into particle and anti-particle pairs. The resulting drop in energy caused the star to collapse under its own huge gravity. After the violent collapse, runaway thermonuclear reactions eventually caused the star to explode, spewing the remains into space. Astronomers now believe that it was not uncommon for first stars to collapse into supernovas, rather than black holes as theorized. This finding has huge implications for the formation of the early universe, since supernovas scatter newly made elements around the galaxy while the massive gravitational pull of black holes permanently lock elements away.

The massive star that produced SN 2006gy apparently expelled a large amount of mass prior to exploding. This large mass loss is similar to that seen from Eta Carinae, a massive star in the Milky Way galaxy, raising suspicion that Eta Carinae may

be poised to explode as a supernova. While SN 2006gy is the brightest supernova observed, it is in a galaxy some 240 million light years away. Eta Carinae, however, is only 7,500 light years away. Astronomers are keeping an eye on the massive star in hopes that it will put on a spectacular—and informative—show considerably closer to home.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Complete Hubble Space Telescope Servicing Mission 4 (SM4) Test Readiness Review.	None	None	None	**7UNIV3 Green**
Complete James Webb Space Telescope (JWST) Integrated Science Instrument Module (ISIM) Preliminary Design Review (PDR).	None	None	6UNIV20 Red	**7UNIV4 Green**
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.	4SEU15 Green	5SEU10 Green	6UNIV14 Green	**7UNIV5 Green**
	4SEU17 Green	5SEU12 Green	6UNIV16 Yellow	
	4ASO9 Blue	5ASO5 Green	6UNIV17 Green	

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

FY04	FY05	FY06	FY 2007
5.8.3 Green	4.3 Green	3D.3 Yellow	**Green**

More than 200 years ago, the philosopher Immanuel Kant first proposed that planets are born from disks of dust and gas that swirl around stars. Despite having detected hundreds of extrasolar planets and many debris disks, astronomers had never observed a planet and a debris disk aligned in the same plane around the same star. In FY 2007, Hubble and ground-based observatories provided the long sought-after confirmation: a planet with its disk. The Jupiter-like gas giant, first detected in 2000, orbits the nearby Sun-like star Epsilon Eridani, located 10.5 light-years from Earth. Epsilon Eridani still retains its disk because it is young, only 800 million years old. The observations also helped astronomers determine the planet's true mass, which they calculated as 1.5 times Jupiter's mass.

Astronomers, using data from Spitzer, laid down the cosmic equivalent of yellow "caution" tape around super-hot stars called O-stars, marking the zones where cooler stars are in danger of having their developing planets blasted away. These are zones (inside of 1.6 light-years, or nearly 10 trillion miles, of an O-star) where ultraviolet radiation from a super-hot star heats and evaporates the potentially planet-forming gas and dust within a debris disk, then winds from the star blow the material away. The findings are helping astronomers pinpoint the types of environments where planets—from massive gas giants to small terrestrial planets like Earth—are most likely to form.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Complete Hubble Space Telescope Servicing Mission 4 (SM4) Test Readiness Review.	None	None	None	**7UNIV3 Green**
Complete James Webb Space Telescope (JWST) Integrated Science Instrument Module (ISIM) Preliminary Design Review (PDR).	None	None	6UNIV20 Red	**7UNIV4 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.	4ASO10 Green	5ASO6 Green	6UNIV1 Green	**7UNIV6 Green**
	4ASO11 Green	5ASO7 Green	6UNIV2 Green	

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

FY04	FY05	FY06	FY 2007
5.1.4 Green	3.4 Green	3D.4 Yellow	**Yellow**

Researchers using Spitzer learned what the weather is like on two distant, exotic worlds. One team of astronomers used the infrared telescope to map temperature variations over the surface of a giant gas planet, HD 189733b, revealing that it likely is whipped by roaring winds. Another team determined that the gas planet HD 149026b is the hottest yet discovered. The two planets are "hot Jupiters," sizzling, gas giants that zip closely around their parent stars. Roughly 50 of the more than 200 known planets outside the solar system are hot Jupiters. Astronomers believe that all hot Jupiters are tidally locked like the Moon, so that one side of the planet always faces the star. The observations revealed that temperatures on HD 189733b are fairly even, ranging from a balmy 1,200º Fahrenheit on the dark side to 1,700º Fahrenheit on the sunlit side. Since the planet's overall temperature variation is somewhat mild, astronomers believe winds must be spreading the heat from the sunlit side to the dark side. On the other hand, temperatures on HD 149026b reach a scorching 3,700º Fahrenheit, even hotter than some low-mass stars. Because the planet is so hot, astronomers believe that the heat is not being spread around and that the dark side is probably much cooler. The oddball planet likely reflects almost no starlight, instead absorbing all of the heat. That means that HD 149026b might be the blackest planet known, in addition to the hottest.

Hubble's powerful vision allowed astronomers to study for the first time the layer-cake structure of the atmosphere of a Jupiter-sized extrasolar planet, called HD 209458b. HD 209458b orbits so close to its star and gets so hot that its upper layer of hot hydrogen gas is streaming into space, making the planet appear to have a comet-like tail. The Hubble data show how intense ultraviolet radiation from the parent star heats the gas in the upper atmosphere, inflating the atmosphere like a balloon. The gas is so hot that it moves very fast and escapes the planet's gravitational pull at a rate of 10,000 tons a second. Previous observations revealed oxygen, carbon, and sodium in the planet's atmosphere, as well as a huge hydrogen upper atmosphere.

Why NASA did not achieve Outcome 3D.4: 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.

Plans for achieving 3D.4: 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 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Demonstrate progress in creating a census of extra-solar planets and measuring their properties. Progress will be evaluated by external expert review.	4ASO12 Blue 4ASO13 Green 4ASO14 Green	5ASO8 Green 5ASO9 Blue 5ASO10 Blue	6UNIV3 Green 6UNIV4 Green 6UNIV5 Yellow	**7UNIV7 Green**
Begin Kepler assembly, test, and launch operations (ATLO).	None	5ASO2 Green	6UNIV21 Yellow	**7UNIV8 Green**

Efficiency Measures

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Complete all development projects within 110% of the cost and schedule baseline.	4ASO1 White	5ASO13 Green	6UNIV22 White	**7UNIV9 Red**
Deliver at least 90% of scheduled operating hours for all operations and research facilities.	None	5ASO14 Yellow	6UNIV23 Green	**7UNIV10 Green**
Peer-review and competitively award at least 80%, by budget, of research projects.	4SEU2 4ASO2 Green	5ASO15 Green	6UNIV24 Green	**7UNIV11 Green**

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
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	6UNIV25 Yellow	**7UNIV12 Green**

Why NASA did not achieve APG 7UNIV9: 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.

Plans for achieving 7UNIV9: 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.

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 (100%)	0	0	0
9 APGs	6 (67%)	1 (11%)	0	2 (22%)

Cost of Performance (in millions)
$594

Responsible Mission Directorate

Contributing Theme

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, AT 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 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 1) major wind tunnels at Ames, Glenn, and Langley Research Centers, and 2) flight operations assets at the Western Aeronautical Test Range, support/test bed 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 2008 Performance Forecast

Fundamental Aeronautics Program

- Develop and test component technology concepts used in conventional aircraft configurations to establish the feasibility of achieving significant noise reduction. For unconventional aircraft configurations, develop and test component technology that establishes the feasibility of achieving short take-off and landings on runways less than 3,000 feet;
- Validate model engine stall-control concepts using component test data to improve the operability range of rotorcraft engines and further improve their range and efficiency;
- Use laboratory tests to validate a composite containment system for supersonic engine fan blades that is 20 percent lighter than the metallic containment system developed by the High Speed Research Program in the late 1990s, demonstrating advancement in new concepts for high-efficiency propulsion and airframes for supersonic aircraft; and
- Establish technology baselines through the evaluation of hypersonic flight simulation tools, Guidance, Navigation and Control (GNC) technologies, and ablator systems using data from the Sub-Orbital Aerodynamic Re-entry Experiments (SOAREX).

Aviation Safety Program

- Develop and validate sensor fusion, fault detection, and isolation methods at the component level
- Develop a framework that integrates current and future detection, prediction, and mitigation methods to prevent aircraft aging-related hazards;
- Develop automation technologies to improve workload responsibilities and crew awareness of critical decision points during the approach and landing phase of flight; and
- Complete a flight evaluation of improved neural networks for a direct adaptive control law with more challenging failures than those performed in FY 2006 to stress the adaptive system.

Airspace Systems Program

- Develop capabilities in traffic flow management, dynamic airspace configuration, separation assurance, and airspace super-density operations which are supported by cross cutting technical areas of trajectory prediction, synthesis, prediction, and uncertainty, performance based services, and system-level design, analysis and simulation tools ; and
- Develop airportal and terminal capabilities in safe and efficient surface operations, coordinated arrival/departure operations, and airportal transition and integration.

Aeronautics Test Program

- Provide partial funding of the fixed costs for most of the ATP facilities, and funds to mothball others; perform significant maintenance activities to improve productivity and reduce operational cost; and invest in test technology and facility upgrades to yield new capabilities
- Implement a centralized force balance capability for aeropropulsion test facilities
- Perform a comprehensive facility assessment to document the physical condition and test capability of ATP facilities, including the status and competency of each facility's technical workforce.

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).

FY04	FY05	FY06	FY 2007
None	None	3E.1 Green	**Green**

Researchers in the Aircraft Aging and Durability project assessed capabilities at NASA, other agencies, and the aerospace industry to establish a baseline for aircraft aging and durability state-of-the-art technologies, refine the approach for subsequent research tasks, and initiate partnerships for collaborative research. In addition, specific technologies were developed to detect, predict, and mitigate aging-related degradation. Some examples include: a tool for assessing wiring connection integrity, a theory and model for measuring metal fatigue, a method for coupling multi-scale models of damage processes in metals, methods for progressive damage analysis in composites, and heat treatments to optimize the durability of third-generation superalloys for engine disk applications. In addition, aging studies were initiated for advanced composites for aircraft airframe and engine fan case structures, and experiments to demonstrate the feasibility of detecting damage in electrical wiring prior to failure were conducted.

The Integrated Vehicle Health Management project, in collaboration with Moog Inc., conducted hardware-in-the-loop nominal and fault injection testing of selected fault modes for electro-mechanical actuators. In addition, a silicon-carbide differential amplifier integrated circuit chip, fabricated for the project's propulsion systems activity, demonstrated more than 2,000 hours of continuous electrical operation at 500° C. Prior to this work, such integrated circuit chips operated at such high temperatures for less than a few hours before degrading or failing. These extremely durable technologies will enable highly functional, but physically small, integrated circuitry to be used for sensing and control electronics within harsh environments, such as hot-sections of jet engines and spacecraft designed for long-duration missions.

The Integrated Intelligent Flight Deck project conducted initial experiments to measure the influence of vision-aiding technology on pilot performance while flying a critical phase of flight such as the final approach segment. The purpose was to begin the definition for quantitative, experimentally derived, performance-based criteria for all-weather Equivalent Visual Operations, systems that help pilots navigate without visual references and maintain safe distances from other aircraft during non-visual conditions. Twenty-three pilots conducted approaches and landings in visibilities ranging from 2,400 feet down to 1,200 feet, with various simulated airport approach lighting systems. Subjective results indicate that vision-based displays offer improvements in situation awareness, workload, and approach and landing performance. Subsequent work will characterize the pilot's awareness and reaction to the non-normal events that were introduced into the experiment.

The Integrated Resilient Aircraft Control project successfully tested a dynamic software tool—a parameter identification algorithm developed to learn and predict changes in aircraft dynamics and aerodynamic coefficients—on the Airborne Subscale Transport Aircraft Research (AirSTAR) flight research testbed. The AirSTAR is intended to allow testing that is too high risk for manned aircraft, especially in off-nominal conditions that are critical for assessing safety concepts and technologies. Such dynamic software tools will enable advanced flight control systems to automatically detect and adapt to off-nominal situations such as a malfunctioning flight actuator or damaged control surface.

FY 2007 Annual Performance Goal	FY04	FY05	FY06	FY 2007
Establish a baseline for state-of-the-art aircraft safety concepts and flight deck information management systems.	None	None	None	**7AT1 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.

FY04	FY05	FY06	FY 2007
None	None	3E.2 Green	**Green**

The NextGen Airspace project developed an operational concept and procedural document, safety analysis, and simulation of oceanic in-trail procedures. The project also conducted human-in-the-loop simulation on very closely spaced parallel approaches addressing techniques for safely getting more and varied aircraft types into the terminal domain, In addition, the Airspace project developed an initial concept for Airspace Super Density Operations that meets the multiple objectives of NextGen terminal airspace operations: significantly increased capacity, robustness to varied and chaotic weather conditions, reduced environmental impact, and coordination of arrival and departure operations to/from multiple proximate airports in a metroplex—a group of two or more airports whose arrival and departure operations are highly interdependent. The project conducted initial assessments of core elements, including: closely-spaced approach procedures, continuous descent arrival operations, four-dimensional trajectory navigation, delegated spacing function, and dynamic routing to avoid adverse weather. In addition, an aircraft-level flow control model was developed and used by the project to examine en route capacity constraints in the congested New York airspace. Results from more than 120 simulation scenarios showed that it is possible to prioritize New York flows through congested sectors without increasing system delays. Before the development of this model, there was no way to systematically look at such flows.

In order to ensure wide dissemination of research results to the broad aeronautics community, the NextGen Airspace project held its first Technical Interchange Meeting focusing on foundational research in March 2007. This event included discussions on the project's research thrust areas and technical presentations by principal investigators for each of the 15 NRAs selected in FY 2006. Over 150 participants from NASA, the Federal Aviation Administration (FAA), industry and academia shared ideas across the research community. Additionally, in February 2007, the project sponsored an international workshop on Dynamic Airspace Configuration, with over 65 participants from the United States and Europe, including academia, industry and government. This workshop addressed the challenges of migrating from the current structured, static homogenous airspace to a dynamic, heterogeneous airspace that adapts to user demand and meets changing constraints (e.g., weather, traffic congestion, diverse fleets).

The NextGen Airportal project moved into implementation in May 2007 after completing reformulation. The project identified key airport capacity constraint factors and ranked them according to airport demand forecasts as a basis for future research and study to accomplish this long-term goal. The project also developed the initial Airportal operational concepts, including Airportal functions, requirements, and procedures to supplement the definition of the initial concept NextGen super-density operations by the Airspace project. Additionally, the Airspace and Airportal projects jointly selected three NRA proposals to conduct research on the characteristics and roles of a metroplex.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Complete flight test evaluation of oceanic in-trail climb and descent using an Airborne Separation Assistance System (ASAS) and an Automatic Dependent Surveillance Broadcast – (ADS-B).	None	None	None	**7AT2 White**
Complete development of an incremental, sustainable transition roadmap from today's air transportation system to the Next Generation Air Transportation System (NGATS) 2025 concept of operations.	None	None	None	**7AT3 Green**

Why NASA rated APG 7AT2 White: NASA completed key elements of this service provider/airline sponsored flight test of oceanic in-trail climb descent using an Airborne Separation Assistance System. However, scheduling and execution of this flight test rests solely with the FAA and Airservices Australia. The flight test was not funded and will not occur and, therefore, NASA canceled the APG. The Airspace Systems Program completed the research support work under NASA's control:

- Documented concept on in-trail procedures (ITP);
- Completed safety methodology and initial analysis that has been reviewed by the International Civil Aviation Organization (ICAO) and scheduled for ICAO acceptance in November 2007;
- Validated ITP simulation; and
- Developed algorithms and engineering models used for procedure development in the NASA simulation tools.

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

FY04	FY05	FY06	FY 2007
None	None	3E.3 Green	**Green**

The Subsonic Fixed Wing project, in partnership with Boeing and the U.S. Air Force, completed flight experiments of the X-48B Blended Wing Body (BWB) advanced aircraft at NASA's Dryden Flight Research Center. The BWB is a hybrid configuration combining the best attributes of a conventional tube-and-wing aircraft with a flying wing. It has the potential to meet expected future NextGen requirements for low noise, low emissions, and high efficiency, with the added potential capability to land and take-off on shorter runways than current aircraft. The flight experiments conducted with the X-48B explored the low-speed aerodynamic performance and stability and control characteristics of this promising aircraft configuration. It is the first time an accurately scaled BWB was flown. The experiments demonstrated the basic flying qualities of the X-48B and the effectiveness of the on-board flight control system.

The Subsonic Rotary Wing project, in partnership with Bell Helicopter Textron and the University of Maryland, conducted a series of helicopter noise tests near Hollister, California, to acquire ground-based acoustic data for maneuvering flight. This test measured the noise from a Bell Model 206 helicopter in both steady and maneuvering flight. Researchers used the NASA Portable Programmable Guidance Display tool to monitor aircraft flight conditions and guide maneuvers to enable precise, repeatable flight trajectories that resulted in data of high accuracy. This is a critical step toward enabling commercial rotorcraft to operate quietly over populated areas.

The Supersonics project completed a flight validation experiment at NASA's Dryden Flight Research Center in which researchers generated and propagated a series of reduced-strength, non-coalescing shocklets (mini sonic booms) produced by the Gulfstream QuietSpike™ device. This allowed the researchers to assess the QuietSpike's effectiveness as a sonic boom mitigation strategy. Increasing aircraft length and slenderness is known to be effective at reducing sonic boom. However, this results in a very heavy aircraft with little usable interior volume and poor low-speed performance. The QuietSpike is an innovative approach, developed by Gulfstream Aerospace, that extends a specially tailored "spike" from the nose of the aircraft, during cruise, to simulate a much longer yet lighter and more slender aircraft.

The Hypersonics project completed 10 successful engine tests of the X-1 scramjet engine in the NASA Langley Research Center's 8 Foot High Temperature Tunnel at simulated Mach numbers of 4.6 and 5.0, with two partially successful tests at Mach 6.5. The tests allowed researchers to quantify engine performance and operability, develop an engine start approach similar to that planned for flight, and demonstrate fuel staging between fuel injection sites. Fuel staging is one of the most

critical issues in developing a viable hypersonic propulsion system. It is the ability to accommodate the transition from partly subsonic flow in the engine combustor (dual-mode) to fully supersonic flow (scram mode) operation as the vehicle accelerates through the hypersonic regime. Failure to properly manage this transition can cause an engine flameout or unstart, both of which would likely result in a loss of mission. The tests conducted at the Langley Research Center provided the necessary data and confidence to allow the U.S. Air Force to proceed toward a series of flight tests in FY 2009.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Baseline state-of-the-art analysis methods and tools to address aeronautics challenges within the hypersonic, subsonic (for rotary and fixed wing vehicles), and supersonic flight regimes.	None	None	None	**7AT4 Green**
Develop preliminary engine performance models for flight-weight propulsion systems to support hypersonic reference vehicles.	None	None	None	**7AT5 Green**
Determine fundamental propulsion system integration design issues for existing and advanced rotorcraft configurations.	None	None	None	**7AT6 Green**

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.

FY04	FY05	FY06	FY 2007
None	None	None	**Green**

The Aeronautics Test Program (ATP) invested approximately $25 million in two years on targeted facility maintenance projects to improve the reliability and ensure the continuous availability of a portfolio of NASA-owned wind tunnels and ground test facilities. This investment reduced the NASA deferred maintenance liability for these national assets by an estimated 10 percent.

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

As part of its continuous efforts to improve facility operational efficiencies, ATP sponsored a National Strain Gage Balance Team, which completed a technical review and concluded that NASA's capability to utilize strain gage balances in wind tunnel testing has severely eroded. ARMD is reviewing several recommendations for FY 2008 implementation.

ATP collaborated with several national organizations and sponsored or co-sponsored several working group meetings (at several sites) to promulgate the National Aeronautics Research and Development Policy and to foster effective partnerships and working relationships. National partners include the Department of Defense (DoD) Test Resource Management Center and the American Institute of Aeronautics and Astronautics U.S. Industry Test Facilities Working Group.

On June 27, 2007, the first National Partnership for Aeronautical Testing (NPAT) Council meeting convened in Washington, DC. This initial meeting set the stage for future council meetings. During future technical interchanges, participants will set a national facility strategy. Participants included the associate administrator for ARMD, as well as the director for ATP, ARMD program directors, and the director for NASA's Shared Capabilities Asset Program; and DoD's director for the Defense Test Resource Management Center and representatives from the separate DoD services.

FY 2007 Annual Performance Goal	FY04	FY05	FY06	FY 2007
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	**7AT7 Green**

Efficiency Measures

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Deliver at least 90% of scheduled operating hours for all operations and research facilities.	None	None	6AT12 Green	**7AT8 Yellow**

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Increase the annual percentage of research funding awarded to Aeronautics University Partnerships.	None	None	None	**7AT9 White**

Why NASA did not achieve APG 7AT8: 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 ATP facilities.

Plans for achieving 7AT8: 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.

Why NASA rated APG 7AT9 White: NASA canceled this APG because it was established prior to the restructuring of ARMD in FY 2006. While ARMD has established a steadily increasing source of external funding that is awarded through a full and open competitive process, such awards are not limited to universities. Industry and nonprofit organizations also are eligible to compete.

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 (100%)	0	0	0
7 APGs	6 (86%)	1 (14%)	0	0

Cost of Performance (in millions)
$208

Responsible Mission Directorate

Contributing Theme

Human Systems Research & Technology (HSRT)

Theme Description

The Human Systems Research and Technology Theme advances knowledge and technologies critical to long-term human health and performance in low Earth orbit and beyond.

PART Assessment Rating

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

Note: ESMD reorganized its Themes and programs for the FY 2008 Budget Estimates. Programs associated with HSRT now are within the Advanced Capabilities Theme.

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 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 Shuttle and 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. Miniaturized environmental monitoring and detection technologies for spacecraft cabin air monitoring have led to spin-offs that have applications for detection of nerve and blister agents, polychlorinated biphenyls and leaks in underground transmission lines. 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 2008 Performance Forecast

- The Exploration Technology Development Program will test technologies for carbon dioxide and humidity removal, water disinfection, and solid waste volume compaction for potential use on Orion. It also will prepare the Electronic Nose and Vehicle Cabin Atmosphere Monitor flight hardware for launch and testing on the ISS.
- NASA will deliver the Combustion Integrated Rack (CIR) to the ISS. The CIR will accommodate a wide variety of combustion experiments.
- The Human Research Program will build, validate, and use the ISS to test technology prototypes used to deliver care to astronauts, including: rapidly deployed EVA sensors, a medical-grade water production system, a ventilation system that uses cabin oxygen instead of stored oxygen, and a capability to analyze blood- and saliva-borne biomarkers.
- The Human Research Program will use ground-based analogs to optimize human systems performance for human-rated vehicles being developed for Constellation Systems.
- The Human Research Program will continue ground- and ISS-based studies of health risks and countermeasures, focusing on: cardiac structure and function, stability of pharmaceuticals and nutrients in space, development of a food system that meets nutrition requirements for long-duration missions, and ways to monitor bone demineralization.
- Using mainly ground-based facilities, NASA will evaluate the increased risk of cancer as a function of age, age at exposure, radiation quality, latency, and gender. NASA also will initiate new studies into the effect of radiation dose rate on cancer risk. These studies will support more accurate prediction of risks and help NASA mitigate the effects of radiation during long-duration space missions.

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

FY04	FY05	FY06	FY 2007
None	None	3F.1 Green	**Green**

The Human Research Program completed final on-orbit operations of the Renal Stone investigation. For the study, which began during Expedition 3 in 2001, investigators examined diet logs combined with urine samples from 20 astronaut subjects to test whether potassium citrate is an effective countermeasure against the formation of kidney stones while crewmembers are in orbit. The risk of kidney stones is elevated in space due to the mobilization of calcium from bone loss and the effects of microgravity on fluid distribution in the body.

The program initiated research using bedrest subjects for a low-intensity mechanical (oscillating plate) countermeasure to prohibit osteoporosis. The data from the research provide early evidence that vibration can correct damage of non-weight bearing to several aspects of the musculoskeletal system. The first ISS experiment will be initiated on Expedition 19 in spring 2009.

The program is conducting research to measure aerobic capacity (oxygen uptake). Two astronaut participants have completed the study, with a third subject in process. The study may require six or more subjects total. Measurement of aerobic capacity allows exercise physiologists and flight doctors to assess crew health and fitness and accurately prescribe exercise countermeasures for use onboard the ISS.

The program also initiated the Bisphosphonates as a Countermeasure to Space Flight Induced Bone Loss experiment. This experiment will determine whether bisphosphonates, in conjunction with the routine in-flight exercise program, will protect ISS crewmembers from the regional decreases in bone mineral density documented on previous ISS missions. This study will commence pending the availability of human subjects on the ISS.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Complete development of a renal stone countermeasure and validate it for use.	None	None	6HSRT9 Yellow	**7HSRT1 Green**
Begin validation of bone and cardiovascular countermeasures on the ISS.	None	None	6HSRT10 Green	**7HSRT2 Green**

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

FY04	FY05	FY06	FY 2007
9.2.1 Green	8.7 Green	3F.2 Green	**Green**

The Exploration Technology Development Program is developing key space exploration technologies for enhanced life support systems, including: the Vapor Phase Catalytic Ammonia Removal system for recycling water from urine, humidity condensate, and sweat; solid waste compaction and odor control technologies; and advanced air revitalization technologies.

During FY 2007, the program conducted several tests of engineering concepts:

- Two engineering concepts for the Carbon Dioxide and Moisture Removal Amine Swing bed System (CAMRAS) to derive performance requirements for the Crew Exploration Vehicle (CEV). CAMRAS met or exceeded all derived performance requirements;
- Two approaches for CEV water disinfection (biocides and point-of-use filters); and
- A standard mechanical prototype trash compactor unit with simulated trash.

The program will provide test information for these candidate approaches to the Constellation Systems Program's CEV project.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Complete laboratory testing of Crew Exploration Vehicle candidate technologies for carbon dioxide (CO2) and humidity removal, water disinfection, and solid waste volume compaction, increasing the technology maturation in all areas.	None	None	None	**7HSRT3 Green**

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

FY04	FY05	FY06	FY 2007
3.3.2 Green	None	3F.3 Green	**Green**

NASA successfully completed the Critical Design Reviews for the Electronic Nose, or ENose, and the Vehicle Cabin Atmosphere Monitor (VCAM). Both the ENose and VCAM monitor the quality of the recycled air aboard the ISS, providing early alert of the presence of harmful gases.

NASA conducted the Dust Aerosol Measurement Feasibility Test (DAFT) and the Smoke and Aerosol Measurement Experiment (SAME) aboard the ISS. The DAFT experiment determined the effectiveness of a commercial hand-held air quality monitor to help in the design of future spacecraft fire detection systems. SAME, which was launched in August 2007 on STS-118, measured dust particles from smoldering materials in microgravity. The results from SAME will help researchers develop and validate smoke detection devices for spacecraft.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Complete critical design review for an ISS technology demonstration of the advanced environmental monitoring system.	None	None	None	**7HSRT4 Green**
Conduct at least two experiments on the ISS to advance next generation technologies for fire prevention, detection, and suppression on spacecraft.	None	None	None	**7HSRT5 Green**

Efficiency Measures

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Increase percentage of HSRT procurement funding, solely dedicated to Exploration Activities.	None	None	None	**7HSRT6 Green**

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
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	6HSRT247 Green	**7HSRT7 Yellow**

Why NASA did not achieve APG 7HSRT7: 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.

Plans for achieving 7HSRT7: Both organizations plan to eliminate some unanticipated schedule conflicts, streamlining the completion process for future Radiation NRAs.

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 (50%)	1 (50%)	0	0
8 APGs	4 (50%)	3 (38%)	0	1 (12%)

Cost of Performance (in millions)
$2,224

Responsible Mission Directorate

Contributing Theme

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 Systems Program to achieve Strategic Goal 4, developing new space transportation capabilities. So far, the program includes the Orion Crew Exploration Vehicle (CEV), the expendable crew launch vehicle Ares I, the heavy-lift cargo launch vehicle (CaLV) 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 Systems development efforts, keeping this highly skilled segment of America's workforce productive and competitive. Constellation Systems also will provide a training ground for the next generation of scientists and engineers who will realize the Nation's space exploration dreams.

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

Risks to Achieving Strategic Goal 4

The Constellation Systems Program is striving to meet challenges in the budgetary and technical areas. Maintaining the investment levels required in a budget-constrained environment is a major challenge facing the Constellation Systems Program. The Constellation Program must manage its development work such that it remains within budget while also

meeting the externally committed milestones of Exploration. In the technical arena, the Constellation Systems 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 2008 Performance Forecast

- The Constellation Systems Program will reach a critical milestone in the latter part of FY 2008, when the Orion and Ares I Preliminary Design Reviews are scheduled to take place. Upon successful completion, these projects will transition from formulation to development.
- Also in the third quarter of FY 2008, Constellation Systems Program will conduct the Systems Definition Review for Mission Operations. Upon successful completion, this project will begin developing and updating processes and facilities needed to support Constellations Systems. The program also will conduct a Systems Definition Review for the Ground Operations project, which is tasked with reconfiguring Shuttle infrastructure capable of supporting Orion and Ares I. Upon successful completion, the project will enable operations and supportability factors to be incorporated into flight hardware designs.
- The Constellation Systems Program will conduct an Extravehicular Activity (EVA) System Configuration 1 Systems Definition Review early in FY 2008. Completion and approval will allow the project to proceed with source selections later in the fiscal year. The project will develop technologies for spacesuits and surface suits, air-lock outfitting equipment, Orion interface hardware, umbilicals, and space helmets. A successful configuration that integrates these elements will maximize capability, reusability, and commonality.

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.

FY04	FY05	FY06	FY 2007
None	7.1 Green	4.1 Green	**Yellow**

Although the Constellation Systems Program did not achieve Outcome 4.1 (due to the lack of program maturity at the time the performance measures were established), the program made significant progress towards demonstrating an operational capability to support human exploration missions. The program conducted key system-level 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. The program completed the Systems Requirements Review (SRR) in November 2006, which initiated a "season of SRRs" for Orion, Ares I, Ground Operations, Mission Operations, and EVA Systems.

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 Ares I project successfully completed its SRR in December 2006, confirming that the Ares I architecture and design concept can fulfill the mission objectives and that the Ares project is ready to begin engineering design activities.

The Ground Operations Project successfully completed its SRR in May 2007 to ensure the system design interfaces and requirements are properly documented, characterized, and integrated with associated systems in the projects Systems Requirements Document.

The Mission Operations Project completed its SRR in March 2007 to document the requirements and capabilities for Constellation Systems mission control facilities, training facilities, and associated mission planning and management support.

Why NASA did not achieve Outcome 4.1: In order to meet an Orion Initial Operational Capability (IOC) of 2014, NASA would require additional funds in the out-years to meet that IOC schedule with a 65 percent cost confidence level in the Agency's budgeting. For the sake of clarity, a cost confidence level is a calculation of the probability of performing a certain task over a given time at a specific cost. With a stable budget, NASA can achieve an IOC launch date of March 2015 at a 65 percent confidence level. Acceleration of this date may be possible given additional funding.

Plans for achieving 4.1: 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 Definitions 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 2007 Annual Performance Goal	FY04	FY05	FY06	FY 2007
Complete the Systems Design Review for the Constellation Program.	None	5TS1 Green	6CS1 Green	**7CS1 Yellow**
Complete the Preliminary Design for the Crew Exploration Vehicle (CEV).	None	None	6CS2 Green	**7CS2 Yellow**
Complete the Preliminary Design for the Crew Launch Vehicle (CLV) First Stage.	None	5TS3 Green	6CS3 Green	**7CS3 Yellow**
Begin construction and/or modifications to Kennedy Space Center ground processing and launch control facilities needed to support the CEV and CLV in accordance with the Systems Requirements Document.	None	None	6CS1 Green	**7CS4 Green**
Begin construction and/or modifications to Johnson Space Center flight control facilities needed to support the CEV and CLV in accordance with the Systems Requirements Document.	None	None	6CS1 Green	**7CS5 Green**

Why NASA did not achieve APGs 7CS1, 7CS2, and 7CS3: These metrics were 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.

Plans for achieving 7CS1: 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 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.

Plans for achieving 7CS2: 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.

Plans for achieving 7CS3: 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.

Outcome 4.2: By 2010, identify and test technologies to reduce total mission resource requirements for life support systems.

FY04	FY05	FY06	FY 2007
None	None	4.2 Green	**Green**

NASA is on schedule to deploy a new space suit with the CEV no later than 2015. In April 2007, the EVA Systems Project presented the acquisition strategy for the design and development of the initial space suit to the Agency management team at the Constellation Space Suit System Procurement Strategy Meeting. The project also successfully conducted the SRR. In July, the project released for industry comment a draft Request for Proposal (RFP) for the Constellation Space Suit System. The final RFP was released in October.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Define the acquisition strategy for the design and development of the initial space suit for exploration.	None	None	None	**7CS6 Green**
Initiate procurement/development of the initial space suit for exploration.	None	None	None	**7CS7 Green**

Efficiency Measures

FY 2007 Annual Performance Goal	FY04	FY05	FY06	FY 2007
Complete all development projects within 110% of the cost and schedule baseline.	None	None	6CS5 Green	**7CS9 White**

Why NASA rated APG 7CS9 White: Constellation Systems did not complete any development projects during FY 2007, so NASA postponed this APG until a later fiscal year.

Strategic Goal 5

Encourage the pursuit of appropriate partnerships with the emerging commercial space sector.

	Green	Yellow	Red	White
3 Outcomes	3 (100%)	0	0	0
3 APGs	2 (67%)	1 (33%)	0	0

Cost of Performance (in millions)
$105

Responsible Mission Directorate

Space Operations (SOMD)

Contributing Theme

Exploration

Space and Flight

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.

The Exploration Systems Research and Technology Theme develops and demonstrates new technologies that will enable future human and robotic exploration missions, including robotic precursor missions for lunar exploration.

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 (replaced ESRT)	2007	Adequate	100%	90%	75%	45%
Space and Flight Support	2007	Moderately Effective	100%	100%	88%	61%

Note: ESMD reorganized its Themes and programs as of NASA's FY 2008 Budget Estimates. Activities included under ESRT now are part of the Advanced Capabilities Theme.

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 SFS. And as the Space Shuttle nears retirement, NASA is interested in ISS cargo delivery and return services provided by emerging 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 vehicles for robotic missions from the commercial sector. NASA works with commercial partners to develop communication and navigation systems, build spacecraft, and design spacesuits. Along the way, the commercial space sector has grown into a multi-billion-dollar industry that delivers services, such as satellite television and global navigation, to the public and contributes to a strong U.S. economy.

Historically, several large corporations have driven the commercial space industry, but now start-up ventures are pushing the sector into new areas. 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 industry 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, Space Exploration Technologies (SpaceX) and Rocketplane–Kistler (RpK), to demonstrate orbital cargo transportation services through the COTS project. The Agency later added to its portfolio by signing unfunded Space Act Agreements with five 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 NPD 8610.7 "Launch Services Risk Mitigation Policy for NASA-Owned and/or NASA-Sponsored Payloads/Missions" to evaluate the feasibility of changes to Agency policy to enable the use of emerging launch service providers. The policy element under review is the number of demonstrated successful launches required for qualification. The risk mitigation is the level of insight NASA is allowed into the launch providers' systems, determining the level of demonstration required. 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 one funded and five unfunded partners onboard, 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 was brought on 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 is conducting a competition in early FY 2008 to bring on an additional funded partner or partners as soon as possible.

FY 2008 Performance Forecast

- In FY 2008, NASA will launch four missions on expendable launch vehicles: the Gamma-ray Large Area Space Telescope (GLAST), the Ocean Surface Topography Mission (OSTM), and the Interstellar Boundary Explorer (IBEX), and the Geostationary Operational Environmental Satellites (GOES)-O. The other two launches are reimbursables for the Missile Defense Agency.
- In winter 2007/2008, NASA will complete a modification to NPD 8610.7, which will enable emerging launch service providers to certify their systems for NASA use.
- NASA will continue transitioning to new working arrangements associated with the formation of the United Launch Alliance.
- NASA will complete the certification of the Taurus XL launch vehicle in support of the Orbiting Carbon Observatory (OCO) and Glory missions scheduled to launch in FY 2009.
- NASA will continue its work toward preparing a contract mechanism for NASA Launch Services to purchase launch services from the emerging U.S. commercial space sector.
- After NASA terminated one of the funded Space Act Agreements, NASA issued a competitive announcement to solicit proposals for a new partner or partners using the remaining funding. In a manner similar to the original round of competition in 2006, NASA intends to enter into a second round of agreements with private industry to develop and demonstrate the vehicles, systems, and operations needed to resupply, return cargo from, and potentially transport crew to and from a human space facility, with the International Space Station providing the representative requirements for such a facility. The Agency is currently reviewing those proposals and hopes to make a decision about whether to fund one or more of the proposals early next year.
- NASA's existing portfolio of funded and unfunded partners is expected to make progress towards demonstrating capabilities associated with Strategic Goal 5 in FY 2008.

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

FY04	FY05	FY06	FY 2007
8.1.1 Green	17.1 Green	5.1 Green	**Green**

LSP completed an Agency strategic review of medium-sized expendable launch vehicle options in which the program recommended that NASA give significant attention to enabling the emerging commercial launch service providers in becoming certified for NASA use. The program also coordinated an Agency review of NASA Policy Document 8610.7, "Risk Mitigation Policy for NASA-Owned and/or NASA-Sponsored Payloads/Missions," to evaluate the feasibility of changes to Agency policy that would enable the use of emerging launch service providers sooner.

FY 2007 Annual Performance Goal	FY04	FY05	FY06	FY 2007
Realize competitive rates from emerging U.S. launch providers and open the bidding process to a larger number of launch providers.	None	None	None	**7SFS4 Green**

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

FY04	FY05	FY06	FY 2007
8.1.1 Green	17.1 Green	5.2 Green	**Green**

The COTS project is a high-risk 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. In August 2006, RpK and SpaceX entered funded Space Act Agreements with NASA to develop cargo transportation to and from low Earth orbit by 2010. Additionally, NASA signed unfunded Space Act Agreements with companies developing and demonstrating their orbital transportation capabilities: PlanetSpace, Inc.; SpaceHab, Inc., SpaceDev, Inc., Transformational Space Corporation (t/space), and Constellation Services International, Inc. (CSI). The performance commitment in FY 2007 was to complete all negotiated deliverables for both funded Space Act Agreements. NASA assesses and funds based on performance against these negotiated milestones. Per this assessment, both funded companies made progress against what was planned. One company completed all five planned deliverables outlined in their agreement, while the other encountered difficulty and worked with the Agency for a mutually acceptable resolution. The latter company was unable to make the full planned progress (completing two out of five planned deliverables) triggering termination of their Space Act Agreement. This is an expected potential outcome for investments in this risk area, and the reason for investing in more than one partner. The overall outcome should be met as one partner is still on track to meet the planned deliverables in the next two years leading up to the on-orbit demonstration in 2010.

FY 2007 Annual Performance Goal	FY04	FY05	FY06	FY 2007
Complete assessment of at least two contractor deliverables that will support the development of vehicles that can provide commercial cargo or crew transport services.	None	5ISS7 Yellow	6ISS2 Green	**7CS8 Yellow**

Why NASA did not achieve APG 7CS8: 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 investing in more than one partner. NASA expects that the long-term goals of the program will be met.

Plans for achieving 7CS8: 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 in the future.

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.

FY04	FY05	FY06	FY 2007
None	None	None	**Green**

Since the beginning of the Centennial Challenges Program through the end of FY 2007, NASA conducted 10 competition events in each of the six unique prize categories, five of which are related to space exploration: Astronaut Glove, Regolith Excavation, Tether, Beam Power, and Lunar Lander. Among these exploration-related competitions, the program awarded one purse of $200 thousand, won by Peter Homer, for the 2007 Astronaut Glove Challenge held on May 3–4 in Windsor Locks, Connecticut.

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. NASA anticipates that at least six prize contests will be conducted in FY 2008.

FY 2007 Annual Performance Goal	FY04	FY05	FY06	FY 2007
Conduct at least two prize competitions that encourage the development and demonstration of advanced, critical technologies supporting NASA's missions and goals.	None	5HRT17 Blue	None	**7ESRT3 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
4 Outcomes	4 (100%)	0	0	0
8 APGs	6 (75%)	0	0	2 (25%)

Cost of Performance (in millions)
$791

Responsible Mission Directorate

Contributing Theme

Exploration Systems Research & Technology (ESRT)

Space and Flight

Theme Description

The Exploration Systems Research and Technology Theme develops and demonstrates new technologies that will enable future human and robotic exploration missions, including robotic precursor missions for lunar exploration.

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
Advanced Capabilities (replaced ESRT)	2007	Adequate	100%	90%	75%	45%
Space and Flight Support	2007	Moderately Effective	100%	100%	88%	61%

Note: ESMD reorganized its Themes and programs as of NASA's FY 2008 Budget Estimates. Activities included under ESRT now are part of the Advanced Capabilities Theme.

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 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 Theme's Exploration Technology Development Program (ETDP, the successor to ESRT) 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 refocusing 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 2008 Performance Forecast

- Prepare the LRO/LCROSS missions for launch in the fourth quarter of 2008 (FY 2009);
- Deliver the prototype five meter-diameter ablative heat shield for Orion;
- Demonstrate an unpressurized rover for transporting crew and payloads across lunar surface in a desert field test;
- Deliver the Combustion Integrated Rack and its insert, the Flame Extinguishment Experiment, in preparation for launch to the ISS;
- After awarding the TDRS replenishment (TDRS K/L) project in the first quarter of FY 2008, complete the Preliminary Design Review;
- Complete upgrades to the NASA Integrated Services Network (NISN) mission network and migrate the services to the new infrastructure;
- Complete the Systems Requirement Review and Preliminary Design Review for the Space Communication and Navigation Network (SCaN) Constellation Integration Program (formerly known as the Exploration Communications and Navigations Systems);
- Review the Deep Space Network requirements for the post-2015 timeframe and assess subsequent alternatives; and
- Complete installation of the 18-meter Ka-band systems at White Sands for the Solar Dynamics Observatory and Lunar Reconnaissance Orbiter (LRO) missions.

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

FY04	FY05	FY06	FY 2007
5.13.1 Green	None	6.1 Green	**Green**

The LRO Program successfully met the critical milestones for the performance period. All instruments and the core spacecraft have completed the Critical Design Review and program partners are fabricating and assembling the hardware. Early integration testing with full instrument and vehicle integration began in fall 2007. NASA successfully completed all design milestones for the Lunar Crater Observation and Sensing Satellite (LCROSS), which will launch with LRO, and the project partners have begun subsystem fabrication and assembly. NASA began the integration and test phase for the LCROSS spacecraft in October 2007 and the mission is on-track for launch with LRO in 2008.

FY 2007 Annual Performance Goal	FY04	FY05	FY06	FY 2007
Complete the Non-Advocate Review (Authority to Proceed) for the Lunar Reconnaissance Orbiter.	None	None	6SSE1 Green	**7ESRT4 Green**

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.

FY04	FY05	FY06	FY 2007
9.4.2 Green	11.3 Green	6.2 Green	**Green**
9.4.1 Green	11.4 Green		

ESMD is developing key technologies, 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. Due to budget reductions, NASA reduced technology efforts. However, with further analysis that led to task reprioritization, ESMD completed a demonstration of oxygen production from simulated lunar regolith using a technology called RESOLVE. Also, ESMD demonstrated remotely supervised deployment of lunar infrastructure at the Desert Rats field test.

Note: NASA reduced several research and technology efforts to meet budgetary needs. As a result, NASA believed that two APGs under Outcome 6.2 would not be achievable, and therefore canceled them, as communicated to Congress in the initial FY 2007 operating plan.

Outcome 6.3: By 2010, identify and conduct long-term research necessary to develop nuclear technologies essential to support human-robotic lunar missions and that are extensible to exploration of Mars.

FY04	FY05	FY06	FY 2007
9.4.3 Green	11.5 White	6.3 Green	**Green**

The Fission Surface Power System (FSP) project transitioned to a focused development and test effort for nuclear power systems that could provide abundant, constant surface power for a lunar outpost at any surface location to enable long-duration stays on the Moon while being extensible for Mars missions. The project team completed the Affordable Fission Surface Power System Study with participation by nuclear power experts from both NASA and the U.S. Department of Energy. The team also continued FSP concept definition activities: initiating a formal reference concept selection; continuing risk-reduction technology research, including development and operation of FSP component and system test facilities; and preparing a draft project plan.

The FSP project is transitioning into ETDP.

FY 2007 Annual Performance Goal	FY04	FY05	FY06	FY 2007
Complete a focused plan and initiate research for nuclear systems technology development for lunar surface fission power generation in support of protracted missions.	None	None	None	**7ESRT5 Green**

Outcome 6.4: Implement the space communications and navigation architecture responsive to Science and Exploration mission requirements.

FY04	FY05	FY06	FY 2007
8.5.1 Green	6.2 Green	6.4 Green	**Green**

In 2006, the Space Communications Program developed a plan for updating NASA's space communications and navigation architecture, as directed in the NASA Authorization Act of 2005. NASA delivered the management-approved report to the House Committee on Science and Technology on July 25, 2007.

The Space Communications Program is working with SOMD, ESMD, and SMD to ensure that communication and navigation needs are met. As part of this effort, the program partners with the commercial sector to obtain and maintain reliable technologies at competitive prices: the Communication Navigation and Networking Reconfigurable Testbed (CoNNeCT), which is investigating reprogrammable (software-defined) radio technology for use during space exploration missions, is a joint government and commercial development project; NASA is working with industry partners on the Tracking and Data Relay Satellite (TDRS) Continuation Project; and the Near Earth Network acquires over 60 percent of tracking services on a commercial fee-for-service basis.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Develop and submit in February 2007 a space communications plan based on an architecture that supports NASA's exploration and science programs for the 2010–2015 timeframe and beyond.	None	None	None	**7SFS1 Green**
Implement technology initiatives consistent with approved baseline space communications and navigations architecture.	4SFS8 Green	5SFS8 Green	6SFS1 Green	**7SFS2 Green**
Pursue commercial opportunities for the space communication and navigation architecture.	None	None	None	**7SFS3 Green**

Efficiency Measures

FY 2007 Efficiency Measure Annual Performance Goals	FY04	FY05	FY06	FY 2007
Complete all development projects within 110% of the cost and schedule baseline.	None	None	6ESRT13 White	**7ESRT6 White**
Complete all development projects within 110% of the cost and schedule baseline.	4SFS14 Green	5SFS21 Green	6SFS7 White	**7SFS5 White**
Deliver at least 90% of scheduled operating hours for all operations and research facilities.	4RPFS11 Green	5SFS22 Green	6SFS8 Green	**7SFS6 Green**

Why NASA rated APG 7ESRT6 White: The Advanced Capabilities Theme was not scheduled to complete any development projects in FY 2007, so NASA postponed this APG until a later fiscal year.

Why NASA rated APG 7SFS5 White: The Space Communication Program was not scheduled to complete any development projects in FY 2007, so NASA postponed this APG until a later fiscal year.

Cross-Agency Support Programs

Cross Agency Support Programs: Education

	Green	Yellow	Red	White
3 Outcomes	3 (100%)	0	0	0
10 APGs	10 (100%)	0	0	0

Responsible Mission Directorate

Contributing Theme

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	2007	Results Not Demonstrated	100%	88%	60%	33%

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 recent research and technology fields into the Agency. To meet long-term workforce needs, NASA's Education programs help inspire students at all levels to pursue STEM-related careers, providing professional development opportunities to STEM teachers, and developing interesting STEM content for the classroom, the Web, and informal learning environments like museums and community-based organizations.

Risks to Achieving Education's Outcomes

Budget stability is the greatest challenge facing the Education Program. To implement its plans with strategic partners, NASA must ensure that it can deliver on its commitments. Continuing and developing new partnerships with formal and informal education providers, as well as attracting and retaining STEM students in success-oriented programs requires consistent and sustained support.

FY 2008 Performance Forecast

- NASA will re-align and restructure projects within Education to focus and accelerate products and services to meet NASA's needs.

Outcome ED.1: Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals through a portfolio of programs.

FY04	FY05	FY06	FY 2007
None	13.2 Green	ED-1 Green	**Green**
None	13.3 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. In FY 2007, Education significantly exceeded several of its award targets: more than 1,000 competitive study opportunities to higher education students; more than 800 study opportunities, including 538 Space Grant consortia, to underserved students, teachers, and faculties; and 139 grants to 50 underrepresented and underserved institutions.

Education initiated a study of previous student participants in NASA education opportunities and its effects on the NASA workforce. Education continues to work with NASA's Office of Human Capital Management's data system to collect, analyze, and report on student participants who have entered the NASA workforce. Additionally, NASA is redesigning its data system to include a student participant tracking system and process. There is no federal data collection system that supports this process.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Award 1,000 competitive internships, fellowships, and research opportunities for higher education students and faculty in STEM disciplines.	None	None	6ED3 Green	**7ED1 Green**
Award 270 competitive scholarships, internships, fellowships, and research opportunities for underrepresented and underserved students, teachers and faculty in STEM disciplines.	None	None	6ED6 Green	**7ED2 Green**
Provide 95 grants to enhance the capability of 50 underrepresented and underserved colleges and universities to compete for and conduct basic or applied NASA-related research.	None	None	6ED7 Yellow	**7ED3 Green**
Collect, analyze, and report longitudinal data on student participants to determine the degree to which participants enter the NASA workforce or other NASA-related career fields.	None	None	6ED5 Green	**7ED5 Green**

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

FY04	FY05	FY06	FY 2007
None	None	None	**Green**

A challenging budget year required the Office of Education to set programmatic priorities which resulted in the funding of projects with the highest contribution potential toward its goals. The Office of Education successfully conducted 10 Educator Astronaut workshops, involving more than 130 educators, and selected and supported 25 additional schools to participate in the NASA Explorer Schools program. Although the Explorer School target to select 50 new schools was not feasible, the objective to maintain a steady-state total of 100 participating schools was met.

Through ISS EarthKAM students were able to perform simple (partial) experiments by taking photographs of Earth using the Web to direct a digital camera during select spaceflights and from the ISS. ISS EarthKAM is a NASA-sponsored research program that provides stunning, high-quality photographs of the planet. These simple student experiments (more than 100 in FY 2007) involved approximately 3,600 middle school students and 54 undergraduate students in authentic, first-hand NASA mission activities.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Conduct 10 Educator Astronaut workshops, involving approximately 200 educators.	None	None	None	**7ED6 Green**
Select and support 50 additional schools to participate in the NASA Explorer Schools program, maintaining the total number at 100.	None	5ED14 Green	None	**7ED7 Green**
Select 100 student experiments, involving 1,000 students, to participate in the Flight Projects program.	None	None	None	**7ED8 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.

FY04	FY05	FY06	FY 2007
None	13.5 Green	None	**Green**

The Office of Education collaborated with NASA's Office of Public Affairs, Office of Communications Planning, Mission Directorates and Field centers to develop partnership strategies and activities to enhance the capabilities of the informal education community. Activities and programs were structured to provide access to NASA staff, research, technology, information and facilities as the means for inspiring the next generation of explorers. 350 museums and science centers were actively engaged in major NASA events in FY 2007. The NASA Space Grant consortium supported 214,106 individuals in informal education projects and activities this year. Additionally, 1,750 informal education providers in organizations as diverse as community and youth groups, astronomy clubs, libraries, and the Boy and Girl Scouts used NASA resources in their programming.

The Office of Education also positioned its E-Education Program to serve as an important linchpin across its portfolio. E-Education was able to advance and support education product reviews, assist approved products in meeting 508-compliancy prior to electronic posting in the NASA Portal, and assist products in meeting standards of the Agency's Communication Materials Review. With a limited budget and the momentum gained from E-Education, three of the four E-Education projects contributed toward digitizing and providing meta-tags to over 10 percent of NASA's approved learning materials using technology-enabled learning systems. Each project had a unique niche in this effort to deliver materials to the end user.

FY 2007 Annual Performance Goal	FY04	FY05	FY06	FY 2007
Digitize and meta-tag 10 percent of NASA's approved learning materials to be delivered using technology-enabled learning systems.	None	None	None	**7ED9 Green**

Efficiency Measures

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Collect, analyze, and report that 100% of grantees annually report on their accomplishments.	None	None	6ED11 Green	**7ED11 Green**
Peer review and competitively award at least 85%, by budget, of research projects.	4ED24 Green	5ED19 Green	6ED12 Red	**7ED12 Green**

Cross Agency Support Programs: Advanced Business Systems (IEMP)

	Green	Yellow	Red	White
2 Outcomes	1 (100%)	0	0	0
3 APGs	3 (100%)	0	0	0

Responsible Mission Directorate Equivalent

Contributing Theme

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
ABS	2006	Moderately Effective	80%	100%	88%	67%

NASA established the Advanced Business Systems 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 2000 with an objective to modernize and integrate NASA's business systems and processes. Since 2000, IEMP has implemented eleven Agency-wide business systems in support of the Agency's Strategic Plan. IEMP will continue to implement four additional Agency systems to provide quality information to decision makers prior to completing the program in FY09.

Benefits

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

NASA's 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: (1) improve the management of Agency and contractor held personal property that will result in cost savings, greater reuse of existing assets and better accountability for assets; (2) provide employees and management with new, secure tools for accessing personnel data, and planning and budgeting NASA's workforce; (3) allow better management of flight operations and logistics for the Agency's aircraft fleet; and (4) standardize travel planning, travel expense reimbursement, payment processing, credit card reconciliation, and travel management reporting for NASA.

Risks to Achieving IEMP's Outcomes and Other Support Activities

One of NASA's challenges is to develop and maintain a concept of operations for Agency-wide business systems. This challenge was highlighted in a recent report produced by the General Accountability Office. The report indicated that NASA had not documented an integrated future vision for the agency's business systems. A concept of operations describes the systems current state, desired future state and associated operational scenarios in layman's terms. This is important since a concept of operations document can be used to support both strategic and design decisions as well as provide context to the user community. A concept of operations allows the reader to understand inter-related functions, high level processes, and tools from an integrated systems point of view. This challenge is complex given the number of business systems throughout the Agency and the need to engage representatives across the user base. NASA recognizes the value in developing an Agency-wide business system concept of operations to support both strategic and tactical decision making.

IEMP also is working to mediate 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 2008 Performance Forecast

- In FY 2008, complete the Integrated Asset Management (IAM) Property, Plant, and Equipment (PP&E) Module implementation at all Centers. The IAM PP&E implementation will integrate processes between PP&E logistics and PP&E financial management, improve PP&E logistics management and improve PP&E financial management.
- By the end of FY 2008, complete HCIE full operational capability at the Centers. HCIE will eliminate redundant systems, consolidate current applications, and integrate the remaining human capital processes and systems And allow NASA managers access to a centralized reporting environment for decision making.
- Continue the Aircraft Management Module Phase 2 implementation. Phase 2 of the AMM project includes the logistics management component, the aircraft and asset maintenance management components and the aircraft configuration management capabilities. The AMM will enhance safety of ground and flight operations, improve visibility into aircraft operations processes and improve financial and business management.

Outcome IEM-1: By 2008, implement Agency business systems that provide timely, consistent and reliable business information for management decisions.

FY 04	FY 05	FY 06	FY 2007
None	None	None	**Green**

IEMP was established in 2000 with an objective to modernize and integrate NASA's business systems and processes. Since 2000, IEMP has implemented eleven Agency-wide business systems in support of the Agency's Strategic Plan. IEMP will continue to implement four additional Agency systems to improve efficiency and provide quality information to decision makers prior to the completion of the program in FY09.

In November 2006, NASA implemented an updated version of the SAP Core Financial software. The update included several critical enhancements that have improved the Agency's compliance with federal financial and accounting systems standards and improved the quality of financial and management information for decision makers. The upgrade improved the data integrity by eliminating duplicate entry in two systems, reducing human error and eliminating manual processes. The FY 2007 financial statements were generated from the updated Core Financial software.

FY 2007 Annual Performance Goal	FY04	FY05	FY06	FY 2007
Upgrade NASA's existing Core Financial system, through the SAP Version Update Project, resulting in improved data integrity.	None	None	None	**7IEM1 Green**

Outcome IEM-2: Increase efficiency by implementing new business systems and reengineering Agency business processes.

FY 04	FY 05	FY 06	FY 2007
None	None	IEM-2 Green	**Green**

Prior to IEMP, NASA's financial, physical, and business management environment was comprised of decentralized, non-integrated systems characterized by function specific, Center-unique policies, procedures, and practices. IEMP engaged a modular and incremental reengineering of business processes and implementation of business systems influenced by federal requirements, contribution to Agency goals, Center needs, design and implementation complexity, data dependencies, and available budget thus bringing increased efficiency to NASA's financial, procurement, human resources and asset management communities. IEMP will continue to reengineer Agency processes and implement new business systems until the program is completed in FY 2009.

In November 2006, NASA implemented the Contract Management Module to support the Agency's needs in contract/grant writing and administration, procurement workload management and data reporting/management. The Contract Management Module provides added efficiency to procurement processes by providing an end-to-end tool that is automated and standard across the Agency. Other efficiencies have been gained by reducing the amount of manual entry required; allowing

procurement professionals more time to focus on strategic procurement activities.

In April 2007, the Aircraft Management Module completed their phase I implementation at all aircraft Centers. The phase I implementation provides the Agency with a tool to help NASA manage the Agency's fleet of mission-support, research, and mission-management aircraft by tracking aircraft inspections, mission configurations and aircrew qualifications. Prior to the phase I implementation, many processes were manual and labor intensive. The Aircraft Management Module will implement phase II at all aircraft centers by September 2009; resulting in improved management and tracking of aircraft repair parts and asset tracking as well as improve the integration with the Agency's financial system.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Implement the Contract Management Module to increase efficiency in procurement processes.	None	None	None	**7IEM2 Green**
Implement the Aircraft Management Module to reduce the risk of flight operations through improved tracking of crew and aircraft currency qualifications.	None	None	None	**7IEM3 Green**

Cross Agency Support Programs: Innovative Partnerships Program (IPP)

	Green	Yellow	Red	White
1 Outcome	1 (100%)	0	0	0
4 APGs	4 (100%)	0	0	0

Responsible Mission Directorate Equivalent

Contributing Theme

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	IPP will be reviewed in 2008	N/A	N/A	N/A	N/A	N/A

To achieve the 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, 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

FY 2008 budget reductions and the FY 2007 budget rescission will have significant negative consequences for the IPP program. The impacts cannot be mitigated without restoring funding cuts. Technology Transfer Partnerships will be reduced by more than one-third across all Centers, resulting in an opportunity cost of more than three times the value in terms of lost leveraged resources from external sources. There also will be significant, proportionate reductions in Center support-contractor workforce. All of these reductions will result in fewer opportunities to develop new and innovative technologies to meet mission needs and reduces resources to secure and commercially apply NASA's intellectual property for the public good. Significantly less funding will be available for SBIR and Small Business Technology Transfer (STTR) awards, where the subject technology development is directly tied to specific Mission Directorate needs. In addition, no new funding for Centennial Challenges eliminates the potential to pursue new challenges that would drive innovation in technology areas critical to the Agency.

FY 2008 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;
- Complete and institutionalize an enhanced Intellectual Property management process; and
- Develop and demonstrate a means for NASA to purchase services from emerging parabolic aircraft flight and suborbital launch providers for microgravity research and training, to the extent limited resources permit.

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.

In FY 2007, IPP helped NASA enter into over 200 Space Act Agreements with private and other external entities for development of dual-use technology targeted to Mission Directorate technology needs. IPP provided $9.2 million in funding for 38 Seed Fund partnerships for development of a broad spectrum of technologies addressing specific Mission Directorate technology gaps. Partner and Center contributions of cash and in-kind resources leveraged these funds by nearly a factor of four. IPP facilitated the signing of 35 license agreements and 682 Software Use Agreements.

In addition, IPP facilitated the reporting of 1,268 new invention disclosures. As a result, 105 NASA patent applications were filed and 93 patents awarded. Revenues realized from licenses of NASA-sponsored technologies exceeded $4 million. NASA patent protection strategic decision processes include consideration of both the likelihood of commercial application of the technology, as well as likelihood of the licensed NASA technology triggering a future partnering opportunity directed at NASA mission needs.

IPP completed the transition of NASA's SBIR/STTR program to a consolidated model better tailored to produce technologies of direct Mission Directorate relevance at less operational cost. IPP also completed six Centennial Challenge events and awarded a combined $450 thousand in prize money to two competition categories (see the Strategic Goal 5 for more information). IPP completed significant groundwork to put in place its FAST program to use commercially provided services to conduct technology demonstrations in a zero- or reduced-gravity environment, maturing technologies needed by NASA. Similarly, IPP made significant progress in establishing its Innovation Transfusion program whereby NASA technical personnel will enhance their capabilities through exposure to innovative technologies, processes, and practices outside of the Agency. IPP has significantly strengthened the relevance of its publications so that the public and other NASA stakeholders may more clearly recognize NASA's contributions to the Nation and humankind. *Spinoff 2007* highlights 39 new examples of how NASA innovation can be transferred to the commercial market place and applied to areas such as health and medicine, transportation, public safety, consumer goods, homes and recreation, environmental and agricultural resources, computer technology and industrial production. Finally, IPP has strengthened the involvement of the Mission Directorates and Mission Support Offices in all of its program elements to better serve Agency-wide and public needs.

FY 04	FY 05	FY 06	FY 2007
10.3.1 Blue	11.7 Green	IPP-1 Green	**Green**

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Develop 20 technology-related significant partnerships that create leveraged 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	None	**7IPP1 Green**
Complete 50 technology transfer agreements with the commercial and academic community through such mechanisms as: licenses, software use agreements, facility use agreements, and space act agreements.	None	None	None	**7IPP2 Green**
Fully implement an annual portfolio licensing approach that targets licensing goals of greatest value/benefit to NASA. Examples of such value are: licensing royalties, and new technology products available to NASA. Royalties should be $4M per year or greater.	None	None	None	**7IPP3 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 two significant NASA programs or projects.	None	None	None	**7IPP4 Green**

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

	Green	Yellow	Red	White
1 Outcome	1 (100%)	0	0	0
2 APGs	2 (100%)	0	0	0

Responsible Mission Directorate Equivalent

Cross Agency Support Programs (CASP)

Contributing Theme

Theme Description

The SCAP Theme 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 routinely 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 2008 Performance Forecast

- SCAP will concentrate on sustaining the infrastructure (base support or underlying structure, i.e., the basic facilities, 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 will continue the management of capabilities added in FY 2007 and will begin to broaden its alliances outside of the Agency for such capabilities as thermal vacuum chambers. Organizations such as the Space Environments Simulation Facilities Alliance will help to strengthen these alliances. SCAP will examine and scrutinize new proposals for additional capabilities submitted as part of the FY 2009 budget process.
- SCAP has identified capabilities no longer required by the Agency and has developed a disposition plan for these assets. During FY 2007, SCAP completed disposition of assets such as the 757 aircraft at Langley Research Center.

SCAP also abandoned the Cryogenic Propellant Tank Facility (K site) and initiated mothballing the Hypersonic Test Facility at Glenn Research Center/Plum Brook Station. Other assets are undergoing the disposition approval process. SCAP will take action on them when final decisions are made.

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.

FY04	FY05	FY06	FY 2007
None	None	None	**Green**

During the FY 2008 budget process SCAP selected, and the Agency started funding in FY 2007, three major strategic categories of assets for incorporation into the SCAP portfolio, including simulators, thermal vacuum chambers, and the arc jet at Ames Research Center. These programs have attracted new users and will be available for future Agency programs. Two new programs were added in Spring 2007: upgrades to the Space Power Facility at Glenn Research Center/Plum Brook Station, and the Microgravity Flight Services Program.

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Prioritize funding requirements and select classes of assets for inclusion in the Strategic Capabilities Assets Program*.	None	None	None	**7SC1 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	None	**7SC2 Green**

* Formerly known as the Shared Capability Assets Program.

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.

	Green	Yellow	Red	White
28 APGs	14 (50%)	3 (11%)	4 (14%)	7 (25%)

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Science Mission Directorate				
Earth–Sun System				
Complete all development projects within 110% of the cost and schedule baseline. (This APG is repeated under Sub-goal 3B.)	4ESS1 Green	5SEC14 Red	6ESS24 Red	**7ESS21 Yellow**
Deliver at least 90% of scheduled operating hours for all operations and research facilities. (This APG is repeated under Sub-goal 3B.)	None	5SEC14 Yellow	6ESS25 Green	**7ESS22 Green**
Peer-review and competitively award at least 80%, by budget, of research projects. (This APG is repeated under Sub-goal 3B.)	4ESA8 Green	5SEC16 Green	6ESS26 Green	**7ESS23 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	6ESS27 Green	**7ESS24 Red**
Solar System Exploration				
Complete all development projects within 110% of the cost and schedule baseline.	4SSE1 Yellow	5SSE15 Yellow	6SSE29 Red	**7SSE10 Red**
Deliver at least 90% of scheduled operating hours for all operations and research facilities.	None	5SSE16 Green	6SSE30 Green	**7SSE11 Green**
Peer-review and competitively award at least 80%, by budget, of research projects.	4SSE2 Green	5SSE17 Green	6SSE31 Green	**7SSE12 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	6SSE32 Green	**7SSE13 Red**
The Universe				
Complete all development projects within 110% of the cost and schedule baseline.	4ASO1 White	5ASO13 Green	6UNIV22 White	**7UNIV9 Red**
Deliver at least 90% of scheduled operating hours for all operations and research facilities.	None	5ASO14 Yellow	6UNIV23 Green	**7UNIV10 Green**
Peer-review and competitively award at least 80%, by budget, of research projects.	4SEU2 4ASO2 Green	5ASO15 Green	6UNIV24 Green	**7UNIV11 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	6UNIV25 Yellow	**7UNIV12 Green**
Aeronautics Research Mission Directorate				
Aeronautics Technology				
Deliver at least 90% of scheduled operating hours for all operations and research facilities.	None	None	6AT12 Green	**7AT8 Yellow**
Increase the annual percentage of research funding awarded to Aeronautics University Partnerships.	None	None	None	**7AT9 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	None	6CS5 Green	**7CS9 White**

FY 2007 Annual Performance Goals	FY04	FY05	FY06	FY 2007
Exploration Systems Research and Technology				
Complete all development projects within 110% of the cost and schedule baseline.	None	None	6ESRT13 White	**7ESRT6 White**
Increase the number of technology products transferred to Constellation Systems developers for mission application.	None	None	None	**7ESRT7 White**
Human Systems Research and Technology				
Increase percentage of HSRT procurement funding, solely dedicated to Exploration Activities.	None	None	None	**7HSRT6 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	6HSRT247 Green	**7HSRT7 Yellow**
Space Operations Mission Directorate				
International Space Station				
Complete all development projects within 110% of the cost and schedule baseline.	4ISS7 Green	5ISS8 Green	6ISS5 Green	**7ISS6 White**
Deliver at least 90% of scheduled operating hours for all operations and research facilities.	None	5ISS9 Green	7ISS6 Green	**7ISS7 Green**
Space and Flight Support				
Complete all development projects within 110% of the cost and schedule baseline.	4SFS14 Green	5SFS21 Green	6SFS7 White	**7SFS5 White**
Deliver at least 90% of scheduled operating hours for all operations and research facilities.	4RPFS11 Green	5SFS22 Green	6SFS8 Green	**7SFS6 Green**
Space Shuttle				
Complete all development projects within 110% of the cost and schedule baseline.	4SSP4 Yellow	5SSP4 Yellow	6SSP2 White	**7SSP4 White**
Deliver at least 90% of scheduled operating hours for all operations and research facilities.	None	5SSP5 Green	6SSP3 Green	**7SSP5 Green**
While ensuring the safety of ongoing flight operations and by working with exploration development programs, reduce Space Shuttle sustaining engineering hours, annual value of Space Shuttle production contracts, and the number of dedicated Space Shuttle facilities, where possible.	None	None	None	**7SSP6 Green**
Cross-Agency Support Programs				
Education				
Collect, analyze, and report that 100% of grantees annually report on their accomplishments.	None	None	6ED11 Green	**7ED11 Green**
Peer review and competitively award at least 85%, by budget, of research projects.	4ED24 Green	5ED19 Green	6ED12 Red	**7ED12 Green**

FY 2007 Performance Improvement Plan

The following table reports all the APGs that NASA was unable to achieve fully in FY 2007 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 as part of 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				
7ESS4 (Outcome 3A.3)	Complete Landsat Data Continuity Mission (LDCM) Confirmation Review.	White	NASA canceled this APG due to a mandated change in the procurement approach.	N/A
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.
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.

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
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.
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.
Heliophysics Theme				
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.
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.

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
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.
Planetary Science Theme				
7SSE3 (Outcome 3C.1)	Complete Juno Preliminary Design Review (PDR).	White	In 2006, NASA postponed the Juno PDR after altering the New Frontiers Program budget and shifting the Juno launch date to a 2010–2011 timeframe. Because NASA did not issue a revised FY 2007 Performance Plan with the FY 2008 Budget Estimate and, therefore, was unable to revise this APG before the beginning of the FY 2007 performance year, management chose to cancel the measure. The Juno PDR is scheduled for May 2008.	N/A
7SSE10 (Efficiency Measures)	Complete all development projects within 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.
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.

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
Astrophysics Theme				
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.
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.
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.
Aeronautics Research				
Aeronautics Technology Theme				
7AT2 (Outcome 3E.2)	Complete flight test evaluation of oceanic in-trail climb and descent using an Airborne Separation Assistance System (ASAS) and an Automatic Dependent Surveillance Broadcast – (ADS-B).	White	NASA completed key elements of this service provider/airline sponsored flight test of oceanic in-trail climb descent using an Airborne Separation Assistance System. However, scheduling and execution of this flight test rests solely with the FAA and Airservices Australia. The flight test was not funded and will not occur and, therefore, NASA canceled the APG. The Airspace Systems Program completed the research support work under NASA's control: • Documented concept on in-trail procedures (ITP); • Completed safety methodology and initial analysis that has been reviewed by the International Civil Aviation Organization (ICAO) and scheduled for ICAO acceptance in November 2007; • Validated ITP simulation; and • Developed algorithms and engineering models used for procedure development in the NASA simulation tools.	N/A

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
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.
7AT9 (Efficiency Measure)	Increase the annual percentage of research funding awarded to Aeronautics University Partnerships.	White	NASA canceled this APG because it was established prior to the restructuring of ARMD in FY 2006. While ARMD has established a steadily increasing source of external funding that is awarded through a full and open competitive process, such awards are not limited to universities. Industry and nonprofit organizations also are eligible to compete.	N/A
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	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.

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
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.
7CS2 (Outcome 4.1)	Complete the Preliminary Design 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.
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.

Performance Measure	Description	Rating	Why the Measure Was Not Met or Was Canceled	Plans for Achieving the Measure (If Not Canceled)
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.
7CS9 (Efficiency Measure)	Complete all development projects within 110% of the cost and schedule baseline.	White	Constellation Systems did not complete any development projects during FY 2007, so NASA postponed this APG until a later fiscal year.	N/A
Advanced Capabilities Theme (Engineering Systems Research & Technology and Human Systems Research & Technology)				
7ESRT6 (Efficiency Measure)	Complete all development projects within 110% of the cost and schedule baseline.	White	The Advanced Capabilities Theme was not scheduled to complete any development projects in FY 2007, so NASA postponed this APG until a later fiscal year.	N/A
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.
Space Operations				
Space Shuttle Theme				
7SSP4 (Efficiency Measure)	Complete all development projects within 110% of the cost and schedule baseline.	White	SOMD was not scheduled to complete any development projects in the Space Shuttle Theme during FY 2007, so NASA has postponed this Efficiency Measure until a later fiscal year.	N/A
International Space Station Theme				
7ISS6 (Efficiency Measure)	Complete all development projects within 110% of the cost and schedule baseline.	White	SOMD was not scheduled to complete any development projects in the ISS Theme during FY 2007, so NASA has postponed this Efficiency Measure until a later fiscal year.	N/A
Space and Flight Support Theme				
7SFS5 (Efficiency Measure)	Complete all development projects within 110% of the cost and schedule baseline.	White	The Space Communication Program was not scheduled to complete any development projects in FY 2007, so NASA postponed this APG until a later fiscal year.	N/A

NASA's FY 2006 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 shortcomings. The following table presents the FY 2006 multi-year Outcomes and APGs that were rated Yellow or Red, the plans and schedules to correct them presented in the FY 2006 Performance Improvement Plan, and the results of FY 2007 follow-up actions.

Description	Rating	Why the Measure Was Not Met	Plans for Achieving the Measure in FY 2007
Science			
6ESS6 (This APG is repeated for Outcomes 3A.1, 3A.2, 3A.3, 3A.4, 3A.5, and 3A.6)			
Improve level of customer satisfaction as measured by a baselined index obtained through the use of annual surveys.	Yellow	The FY 2006 EOSDIS customer satisfaction survey, performed by the Claes-Fornell Institute (CFI), produced a score of 74, a decrease from a high score of 78 in 2005, but above the federal government average of 71.	Consistent with past practice, CFI provided detailed survey data, which will enable NASA to focus its ongoing efforts to improve Earth science data, information, and services provision. Specific attention will be given to ways of maintaining and improving customer satisfaction while also focusing on the potentially conflicting, but very important, goals of increasing the number and types of users and new data types.
FY 2007 Follow-up: Throughout FY 2007, NASA worked with CFI to improve customer satisfaction as described in the FY 2006 Performance Improvement Plan. The EOSDIS customer satisfaction score increased to 75 in FY 2007, again exceeding the federal government average of 72.			
Outcome 3A.4			
Progress in quantifying the key reservoirs and fluxes in the global water cycle and in improving models of water cycle change and fresh water availability.	Yellow	Research results in 2006 enabled significant progress in understanding and modeling the water cycle. However, delays in the development and launch of the Global Precipitation Measurement (GPM) mission and the NPOESS Preparatory Project (NPP) will impact NASA's progress in this science focus area.	NASA will develop an Earth science roadmap based on the mission priorities established in the decadal survey, available in November 2006. The Agency will use the roadmap to re-baseline the support available to GPM by the end of 2006 and provide finalized support by the spring of 2007. Program funding supports the NPP 2009 launch date.
FY 2007 Follow-up: NASA worked towards achieving this as described in the FY 2006 Performance Improvement Plan, and rated the Outcome "Green" for FY 2007.			
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	Cost overruns and technical difficulties delayed the NPOESS Preparatory Project (NPP) mission, which will impact NASA's progress in this science focus area.	Program funding supports the NPP 2009 launch date.
FY 2007 Follow-up: The program funding in question was put in place before the close of FY 2006. However, the 2009 NPP launch date is currently at risk, and this Outcome remains "Yellow" for FY 2007.			
6ESS23 (Outcome 3A.5)			
Complete Operational Readiness Review for the NPOESS Preparatory Project (NPP).	Red	Due to late delivery of the key Visible/Infrared Imager/Radiometer Suite (VIIRS) instrument from a program partner, NASA moved the Operational Readiness Review for NPP to September 2009.	NASA management postponed this review until FY 2008.
FY 2007 Follow-up: The Operational Readiness Review is scheduled for September 2009, as stated under "Why the Measure Was Not Met." The timeframe of FY 2008 reported under "Plans for Achieving the Measure" was incorrect.			

Description	Rating	Why the Measure Was Not Met	Plans for Achieving the Measure in FY 2007
6ESS21 (Outcome 3A.7)			
Benchmark the assimilation of observations and products in decision support systems serving applications of national priority. Progress will be evaluated by the Committee on Environmental and National Resources.	Yellow	NASA completed this benchmarking in support of such areas as agricultural efficiency, air quality, aviation, disaster management, and public health. However, the external evaluation was postponed, primarily due to delays related to committee members' schedules.	The National Research Council will finalize its evaluation by spring 2007. Results will be available through *http://aiwg.gsfc.nasa.gov*, and will be addressed in the FY 2007 Performance and Accountability Report.
FY 2007 Follow-up: In 2007, the National Research Council published *Assessment of the NASA Applied Sciences Program*, available at www.nap.edu/catalog.php?record_id=11987.			
6ESS24 (Efficiency Measure)			
Complete all development projects within 110% of the cost and schedule baseline.	Red	The STEREO and AIM missions, scheduled for completion in FY 2006, exceeded 110% of the cost and schedule baselines. After launch vehicle delays, STEREO was launched on October 25, 2006, exceeding the baseline schedule by 25%. The final cost exceeded the baseline by 26%. AIM is currently scheduled for launch in spring 2007 and is expected to exceed both the cost and schedule baselines by approximately 20% due to delays associated with the launch vehicle and the failure of the SOFIE instrument during observatory vibration testing.	NASA will continue to conduct appropriate reviews as the AIM mission progresses toward launch.
FY 2007 Follow-up: NASA launched AIM on April 25, 2007.			
6SSE27 (Outcome 3C.1)			
Successfully launch Dawn spacecraft.	Yellow	NASA delayed the launch of Dawn due to technical difficulties.	Dawn underwent reviews to address technical and cost issues and the launch is currently scheduled for June 2007.
FY 2007 Follow-up: Due to consistently bad weather and technical problems with launch vehicle tracking systems off the coast of Africa, NASA rescheduled the Dawn launch to a September–October timeframe. NASA launched the Dawn mission on September 27, 2007.			
6SSE9 (Outcome 3C.2)			
Successfully demonstrate progress in understanding why the terrestrial planets are so different from one another. Progress toward achieving outcomes will be validated by external expert review.	Yellow	External reviewers deemed all of the evidence presented for this APG as positive. However, since the evidence was based on preliminary results, the external reviewers rated the progress on this goal as less robust than the progress seen in other areas of planetary science.	NASA-funded investigators are participating in the European Space Agency's Venus Express mission. Venus Express, launched in November 2005, arrived at Venus in April and is orbiting the planet, studying its atmosphere in detail. In addition, under the Discovery Program 2006 Announcement of Opportunity, NASA selected for concept study a return to Venus mission. Vesper, the Venus Chemistry and Dynamics Orbiter, proposes to significantly advance understanding of the atmospheric composition and dynamics of Venus, especially its photochemistry. Successful completion of the concept study would allow continuation into a full design effort.
FY 2007 Follow-up: NASA followed the FY 2006 improvement plan as stated. In December 2007, NASA announced the selection of the Gravity Recovery and Interior Laboratory (GRAIL) as the next Discovery mission.			

Description	Rating	Why the Measure Was Not Met	Plans for Achieving the Measure in FY 2007
6SSE19 (Outcome 3C.2)			
Successfully demonstrate progress in understanding the character and extent of prebiotic chemistry on Mars. Progress toward achieving outcomes will be validated by external expert review.	Yellow	The lack of direct measurements has limited NASA's progress in this area. While laboratory and field research enabled some progress, direct measurements have not been made since the Viking missions in the 1970s.	The next two Mars missions, Phoenix, to be launched in 2007, and the Mars Science Laboratory, to be launched in 2009, have technology to directly measure organic compounds and potentially elucidate the character and extent of prebiotic chemistry.
FY 2007 Follow-up: NASA followed the FY 2006 improvement plan as stated. The Phoenix Mars Lander launched on August 4, 2007, and will land on Mars in May 2008. The Mars Science Laboratory is on schedule for launch in 2009.			
6SSE20 (Outcome 3C.3)			
Successfully demonstrate progress in searching for chemical and biological signatures of past and present life on Mars. Progress toward achieving outcomes will be validated by external expert review.	Yellow	Although the current missions at Mars are extremely capable and have exceeded expectations, NASA did not design the instrumentation to address this objective.	The next two Mars missions, Phoenix, to be launched in 2007, and the Mars Science Laboratory, to be launched in 2009, have the capability to measure organic compounds and mineralogy to search for chemical and biological signatures of life.
FY 2007 Follow-up: NASA followed the FY 2006 improvement plan as stated. The Phoenix Mars Lander launched on August 4, 2007, and will land on Mars in May 2008. The Mars Science Laboratory is on schedule for launch in 2009.			
6SSE29 (Efficiency Measure)			
Complete all development projects within 110% of the cost and schedule baseline.	Red	The New Horizon and Dawn missions, scheduled for completion in FY 2006, exceeded 110% of the cost baseline. New Horizons, which was launched on time—January 19, 2006—exceeded the cost baseline by 15%. The Dawn mission, which underwent reviews to address technical and cost issues, is expected to exceed the cost baseline by 32% and the schedule baseline by 43% with the launch being delayed to 2007.	NASA will continue to conduct appropriate reviews as the Dawn mission progresses toward launch.
FY 2007 Follow-up: NASA followed the FY 2006 improvement plan as stated. Due to consistently bad weather and technical problems with launch vehicle tracking systems off the coast of Africa, NASA rescheduled the Dawn launch from June 2007 to a September–October 2007 timeframe. NASA launched the Dawn mission on September 27, 2007.			
6UNIV19 (Outcome 3D.1)			
Complete Gamma-ray Large Area Space Telescope (GLAST) Spacecraft Integration and Test (I&T).	Yellow	NASA postponed the GLAST I&T due to electronic parts problems and the need to change release mechanisms on the spacecraft.	Spacecraft I&T is scheduled currently for early FY 2007.
FY 2007 Follow-up: NASA completed the GLAST I&T in March 2007. GLAST remains behind the planned schedule, and NASA rated APG 7UNIV2 (Complete Gamma-ray Large Area Space Telescope (GLAST) Operations Readiness Review (ORR)) "Yellow." GLAST is scheduled for launch in mid-2008.			
6UNIV20 (Outcomes 3D.1, 3D.2, and 3D.3)			
Complete James Webb Space Telescope (JWST) Mission Preliminary Design Review (PDR).	Red	NASA revised the JWST schedule in response to growth in the cost estimate that NASA had identified in FY 2005.	NASA moved the launch date to 2013. As a result, NASA will hold the PDR in March 2008.
FY 2007 Follow-up: The PDR is scheduled for March 2008.			

Description	Rating	Why the Measure Was Not Met	Plans for Achieving the Measure in FY 2007
Outcome 3D.2			
Progress in understanding how the first stars and galaxies formed, and how they changed over time into the objects recognized in the present universe.	Yellow	NASA made scientific progress toward this Outcome, but delays in the development and launch of JWST will impact future results.	The James Webb Space Telescope has undergone a comprehensive project replan. The mission is scheduled to launch in 2013.
FY 2007 Follow-up: NASA followed the FY 2006 Improvement Plan as stated. During FY 2007, the Universe Theme completed the PDR for JWST's Integrated Science Instrument Module as planned, and NASA rated the JWST APG (7UNIV4) "Green." The solid progress achieved on JWST during FY 2007, combined with ongoing science results in this Outcome, put NASA on track to achieve 3D.2.			
6UNIV16 (Outcome 3D.2)			
Successfully demonstrate progress in discovering how the interplay of baryons, dark matter, and gravity shapes galaxies and systems of galaxies. Progress toward achieving outcomes will be validated by external expert review.	Yellow	The external review found that NASA made limited progress toward this performance goal. Comments included the opinion that this goal, as written, was too challenging or ambitious, and suggested that it be dropped. Reviewers noted that APGs 6UNIV14 and 6UNIV17 also will yield information about the interplay of baryons, dark matter, and gravity in the evolution of galaxies.	NASA will change this APG in FY 2007.
FY 2007 Follow-up: NASA changed this APG as stated.			
Outcome 3D.3			
Progress in understanding how individual stars form and how those processes ultimately affect the formation of planetary systems.	Yellow	NASA made scientific progress on this Outcome, but future results will be impacted by delays in the SOFIA and JWST programs. These two new facilities are expected to make significant progress in star formation studies because of their mid- and far-infrared observation capabilities.	See SOFIA (6UNIV18) and JWST (6UNIV20) performance measures.
FY 2007 Follow-up: Progress on SOFIA has improved during FY 2007 and progress on JWST has been very good, resulting in a "Green" rating for this Outcome.			
6UNIV18 (Outcome 3D.3)			
Complete Stratospheric Observatory for Infrared Astronomy (SOFIA) Airworthiness Flight Testing.	Red	NASA chartered a review in March 2006 to document the status of the SOFIA Program and to identify and analyze options. NASA determined the most appropriate course of action is to continue the SOFIA Program with significant program restructuring, including transferring the direct management of SOFIA's airborne system (aircraft and telescope) development and extensive flight testing to Dryden Flight Research Center.	NASA will transfer the SOFIA airborne system to DFRC in early 2007 to initiate the flight test program. An operational readiness review will follow completion of this extensive flight test program in 2010.
FY 2007 Follow-up: The program team transferred SOFIA to Dryden Flight Research Center and the program is making anticipated progress. The equivalent of "airworthiness flight testing" is scheduled for 2010, as reported in the FY 2006 Performance Improvement Plan.			

Description	Rating	Why the Measure Was Not Met	Plans for Achieving the Measure in FY 2007
Outcome 3D.4			
Progress in creating a census of extra-solar planets and measuring their properties.	Yellow	NASA made scientific progress on the Outcome, but delays in the development and deployment of next generation missions will impact further results.	Kepler I&T is scheduled to begin in June 2007, with a launch readiness date of November 2008. NASA deferred the Space Interferometry Mission (SIM) beyond the budget planning period.
FY 2007 Follow-up: Kepler I&T began in September 2007. The launch readiness date is now February 2009. This Outcome is rated "Yellow" again in FY 2007, with the following explanation of the shortfall: Performance in this Outcome continues to be a concern due primarily to the division's 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 division's decreasing top line and other significant commitments, have meant that earlier envisioned missions have slipped outside 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.			
6UNIV5 (Outcome 3D.4)			
Progress in creating a census of extra-solar planets and measuring their properties.	Yellow	NASA made scientific progress on the Outcome, but delays in the development and deployment of next generation missions will impact further results.	Kepler I&T is scheduled to begin in June 2007, with a launch readiness date of November 2008. NASA deferred the Space Interferometry Mission (SIM) beyond the budget planning period.
FY 2007 Follow-up: Kepler I&T began in September 2007. The launch readiness date is now February 2009. The external expert review gave this area a "Green" rating for FY 2007 due to significant science progress in current census activities.			
6UNIV21 (Outcome 3D.4)			
Begin Kepler Spacecraft Integration and Test (I&T).	Yellow	Inefficiencies, particularly with regard to work on the spacecraft's photometer, caused delays and cost impacts for the Kepler project and an inability to maintain the previous launch schedule of June 2008.	Kepler I&T is currently scheduled to begin in June 2007, with a launch readiness date of November 2008.
FY 2007 Follow-up: Kepler I&T began in September 2007.			
6UNIV25 (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	NASA reduced the time necessary to award 80% of NRA grants by 2.5% from FY 2005 to FY 2006, missing the 5% target.	The Science Mission Directorate will continue to make efforts to reduce processing times and expects to meet this APG assuming no changes in procurement requirements or funding calendar.
FY 2007 Follow-up: The Universe Theme achieved its FY 2007 goal of completing 80% of grant selections within 219 days of the proposal due date. By achieving a timeframe of 196 days, the Universe Theme improved the time from proposal to selection by 15 percent over FY 2006, exceeding the 5 percent required by the APG.			
Aeronautics Research			
6AT14 (Outcome 3E.1)			
Complete Aviation Safety Program restructuring activities in order to focus research efforts more precisely on the Nation's aviation safety challenges for the Next Generation Air Transportation System (2025) and beyond.	Yellow	The Aviation Safety Program delayed approval of one of its four projects: The Integrated Resilient Aircraft Controls, which develops capabilities to reduce (or eliminate) aircraft loss-of-control accidents and ensure safe flight under off-nominal conditions.	Program management expects final approval of this project during the first quarter of FY 2007.
FY 2007 Follow-up: The Aviation Safety Program moved the Integrated Resilient Aircraft Controls Project into implementation in May 2007, and the project conducted research in FY 2007 as anticipated.			

Description	Rating	Why the Measure Was Not Met	Plans for Achieving the Measure in FY 2007
6AT15 (Outcome 3E.1)			
Utilizing a competitive peer-reviewed selection process, determine the research portfolio and partnerships to enable advances in the Aviation Safety thrust areas (Integrated Intelligent Flight Deck Technologies, Integrated Vehicle Health Management, Integrated Resilient Aircraft Controls, and Aircraft Aging and Durability).	Yellow	The Aviation Safety Program delayed approval of one of its four projects: The Integrated Resilient Aircraft Controls, which develops capabilities to reduce (or eliminate) aircraft loss-of-control accidents and ensure safe flight under off-nominal conditions.	Program management expects final approval of this project during the first quarter of FY 2007.
FY 2007 Follow-up: The Aviation Safety Program moved the Integrated Resilient Aircraft Controls Project into implementation in May 2007, and the project conducted research in FY 2007 as anticipated.			
6AT16 (Outcome 3E.2)			
Complete Airspace Systems Program restructuring activities in order to align research efforts to address the Joint Planning and Development Office's Next Generation Air Transportation System (NGATS) capability requirements for 2025.	Yellow	The Airspace Systems Program delayed approval of a portion of its project portfolio (the NGATS Air Traffic Management Airportal project) that will develop capabilities to increase throughput in terminal and airport domains enabling NGATS.	The approval of the NGATS Air Traffic Management Airportal Project is expected in the first quarter of FY 2007.
FY 2007 Follow-up: The Airspace Systems Program moved the NGATS Air Traffic Management Airportal Project into implementation in May 2007, allowing the program to achieve its APGs in FY 2007.			
6AT17 (Outcome 3E.2)			
Utilizing a competitive peer-reviewed selection process, determine the research portfolio and partnerships to enable advances in the Airspace Systems thrust areas (Next Generation Air Transportation Systems and Super Density Surface Management.)	Yellow	The Airspace Systems Program delayed approval of a portion of its project portfolio (the NGATS Air Traffic Management Airportal project) that will develop capabilities to increase throughput in terminal and airport domains enabling NGATS.	The approval of the NGATS Air Traffic Management Airportal Project is expected in the first quarter of FY 2007.
FY 2007 Follow-up: The Airspace Systems Program moved the NGATS Air Traffic Management Airportal Project into implementation in May 2007. During FY 2007, the project selected three NASA Research Announcement proposals, completing this APG and allowing the program to meet its performance targets for FY 2007.			
Exploration Systems			
6HSRT9 (Outcome 3F.1)			
Complete renal stone countermeasure development.	Yellow	NASA researchers did not complete the renal stone countermeasure study.	Data collection from the final subject is scheduled for March 2007.
FY 2007 Follow-up: By spring 2007, 20 test subjects had participated in the renal stone countermeasure study, giving NASA enough data to conduct the final analysis. See the Outcome narrative for 7HSRT1 under Sub-goal 3F for more information.			

Description	Rating	Why the Measure Was Not Met	Plans for Achieving the Measure in FY 2007
Space Operations			
Outcome 1.1			
Assure the safety and integrity of the Space Shuttle workforce, systems and processes, while flying the manifest.	Yellow	The Space Shuttle Program reported and investigated three major incidents in FY 2006. Two Type-B mishaps include damage to *Discovery*'s robotic manipulator arm caused while crews were servicing the Shuttle in the Orbiter Processing Facility hangar, and damage to *Atlantis*' coolant loop accumulator due to over-pressurization. NASA also reported a personnel injury at Kennedy Space Center's Launch Complex 39A.	NASA convened a mishap investigation board for each incident. The boards are on schedule to complete their investigations and deliver their final reports in FY 2007.
FY 2007 Follow-up: The mishap investigation boards have completed their investigations and released their final reports to the Program Office on April 18, 2007, and corrective actions are in work.			
6SSP1 (Outcome 1.1)			
Assure the safety and integrity of the Space Shuttle workforce, systems and processes, while flying the manifest.	Red	The Space Shuttle Program reported and investigated three major incidents in FY 2006. Two Type-B mishaps include damage to *Discovery*'s robotic manipulator arm caused while crews were servicing the Shuttle in the Orbiter Processing Facility hangar, and damage to *Atlantis*' coolant loop accumulator due to over-pressurization. NASA also reported a personnel injury at Kennedy Space Center's Launch Complex 39A.	NASA convened a mishap investigation board for each incident. The boards are on schedule to complete their investigations and deliver their final reports in FY 2007.
FY 2007 Follow-up: The mishap investigation boards have completed their investigations and released their final reports to the Program Office on April 18, 2007, and NASA is conducting corrective actions.			
6ISS3 (Outcome 2.1)			
Provide 80 percent of FY 2006 planned on-orbit resources and accommodations to support research, including power, data, crew time, logistics and accommodations.	Yellow	NASA was unable to meet the original goal of regularly scheduled Shuttle flights throughout FY 2006 due to foam issues on the external tank. While these issues were resolved, NASA did not launch the Shuttle until July 2006—10 months after the start of FY 2006. Shuttle flight delays reduced actual upmass and volume capabilities.	Shuttle schedules have been adjusted for FY 2007, but these schedules always are subject to change as circumstances warrant.
FY 2007 Follow-up: Using Russian Soyuz and Progress flights to the ISS, NASA met this performance measure within FY 2006. The Space Operations Mission Directorate upgraded this measure to "Green" in September 2006, but NASA did not capture the change in the FY 2006 PAR. Performance measure 6ISS3 will be rated "Green" in trending information beginning with this report.			
Cross Agency Support Programs			
6ED4 (Outcome ED-1)			
Complete a retrospective longitudinal study of student participants to determine the degree to which participants entered the NASA workforce or other NASA-related career fields.	Yellow	NASA did not complete the retrospective study of student participants' entry into the NASA workforce due to technical issues directly related to the large population of potential survey respondents.	NASA is adjusting the survey instrument and protocol and the survey will be completed in FY 2007.
FY 2007 Follow-up: As a result of funding reductions and programmatic reprioritization, NASA canceled this APG.			

Description	Rating	Why the Measure Was Not Met	Plans for Achieving the Measure in FY 2007
6ED7 (Outcome ED-1)			
Provide approximately 50 grants to enhance the capability of approximately 25 underrepresented and underserved colleges and universities to compete for and conduct basic or applied NASA-related research. (APG revised: grants reduced from 350 to 50 based on FY 2006 Appropriation.)	Yellow	NASA exceeded the number of institutions during FY 2006, but did not achieve the targeted number of grant awards.	NASA's FY 2007 budget includes funds necessary to achieve future goals.
FY 2007 Follow-up: For FY 2007, NASA increased the targeted number of grants from 50 to 95 (see APG 7ED3). This target was exceeded by 44 grants (see Outcome ED-1 narrative) due to reprioritization of funding and an increased number of minority institutions that successfully competed for other NASA education awards.			
6ED12 (Efficiency Measure)			
Peer review and competitively award at least 80%, by budget, of research projects.	Red	NASA could not complete this performance measure due to Congressionally directed, site-specific projects which accounted for approximately 50% of the Education Program's appropriation.	NASA has briefed relevant Congressional committee staff regarding the impact of Congressional interest items. NASA's FY 2007 program plan will achieve the target of 80% competitive awards unless Congressionally directed appropriations exceed 20% of the budget.
FY 2007 Follow-up: The intent of this APG had been for NASA to use the Higher Education budget for research projects, but it was not explicitly stated in the APG. Education met the FY 2007 performance target of 85% (see Efficiency Measure, 7ED12).			

PART Status and Improvement Plans

PART is an evaluation tool developed by 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 program portfolios, or Themes, 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.

The table below summarizes the FY 2007 PART status and improvement plans for each Theme organized by Mission Directorate. Additional discussion of PART plans is included under "Program Assessment Rating Tool (PART)" within the Theme sections of NASA's FY 2009 Budget Estimates. For detailed listings of NASA's program measures and assessments or for more on PART, please visit OMB's PART Web site at ExpectMore.gov.

<table>
<tr><th colspan="4">Science Mission Directorate</th></tr>
<tr><th colspan="4">Theme: Earth–Sun System</th></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 Earth–Sun System Theme, which included both Earth Science and Heliophysics, was subject to a PART review in 2005 and received a "Moderately Effective" rating (score of 84%). 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, the Earth-Sun System is separated into two distinct themes: Earth Science, which will undergo its next PART review during the year; 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 Fall 2007:
• <u>Action taken; expected completion date 12/31/2009:</u> NASA provided its initial baseline cost/schedule report to OMB on its spaceflight projects with an estimated lifecycle of $250M or above, in August 2007. This was per NSPD 49 implementation. Since then NASA has provided quarterly updates against this baseline. Several new requirements have been added to the Agency from the Congress. Further, there have been lessons learned as a result of the reporting process. NASA will update its process in light of these two things by March 2008.
• <u>Completed:</u> NASA and its partners have approaches in place to transition mature NASA research and development to other federal agencies. For example, NASA and NOAA have recently signed a Research and Operations Agreement and have identified a broad range of Earth science activities that are good candidates for infusion into future NOAA operational activities. As another example, NASA and USGS are working together with the OSTP to complete a strategy to assure continuity of Landsat-type data beyond LDCM.</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: Solar System Exploration

Last Year Assessed: 2006		**Rating:** Effective	
Program Purpose and Design: 100%	**Strategic Planning:** 100%	**Program Management:** 91%	**Program Results/ Accountability:** 74%
Rating Rationale: The Planetary Science Theme was subject to a PARTs review in both 2003 and 2006 and received an "Effective" rating both times. The assessment found that this program is well-defined and well-managed, with a clear purpose and direct ties to NASA's mission. The program has relevant research priorities, that reflect the priorities of the planetary science community. Further, that the program 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: • 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. • 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. • 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.		**Actions as of Fall 2007:** • Action taken; expected completion date 12/31/2009: NASA provided its initial baseline cost/schedule report to OMB on its spaceflight projects with an estimated lifecycle of $250M or above, in August 2007. This was per NSPD 49 implementation. Since then NASA has provided quarterly updates against this baseline. Several new requirements have been added to the Agency from the Congress. Further, there have been lessons learned as a result of the reporting process. NASA will update its process in light of these two things by March 2008. • 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. • Action taken; expected 12/31/2009: This action is expected to move to the Space and Flight Support Theme and will not be completed until the FY 2010 budget submission.	

Theme: Astronomy and Astrophysics Research

Last Year Assessed: 2007		**Rating:** Adequate	
Program Purpose and Design: 100%	**Strategic Planning:** 100%	**Program Management:** 75%	**Program Results/ Accountability:** 47%
Rating Rationale: The Astrophysics Theme received a PART rating of "Adequate" in 2007. The assessment found that the program 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: • 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.		**Actions as of Fall 2007:** • Action taken; expected completion date 12/31/2009: NASA provided its initial baseline cost/schedule report to OMB on its spaceflight projects with an estimated lifecycle of $250M or above, in August 2007. This was per NSPD 49 implementation. Since then NASA has provided quarterly updates against this baseline. Several new requirements have been added to the Agency from the Congress. Further, there have been lessons learned as a result of the reporting process. NASA will update its process in light of these two things by March 2008.	

• 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: SMD has adopted a new management approach featuring control of cost through scope changes and other methods that allow missions to be managed within cost caps while maintaining risk at acceptable levels. A key focus is on ensuring that project budget and scope are aligned early in the formulation phase, as was recently addressed for the MMS mission. Other efforts include the pursuit of new partnerships and expanded cost-sharing with existing partners for SOFIA and other programs.
• 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 Division has instituted Earned Value Management (EVM) reporting for all contractors on major missions. Other methods have also been employed; these include the reallocation of a portion of the Kepler prime contractor's fee to be awarded contingent on the achievement of specific performance measures.
• 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: In the FY09 budget, SMD has placed an emphasis on maximizing near-term opportunities in the Explorer, Sounding Rockets, and Balloon programs to strengthen the science community. SMD's new cost control ethic is also a part of this effort. Flagship missions have been added to the senior review process normally reserved for smaller missions to assess the value of continuation after completion of prime missions. SMD is also evaluating efficiency metrics in preparation for the 2008 PART process.
• Making grantee annual performance data available on the NASA web site.	• Action taken; expected completion date 6/30/2009: The NASA website currently indicates when grantees' annual progress reports have been reviewed and approved, a requirement for release of the next year's funding increment. The Agency is investigating systems for posting grant results; further action will be taken consistent with the pending OSTP requirements regarding standardization of progress reports.

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: In FY 2007, the Aeronautics Technology Theme received a PART rating of "Effective" (the highest rating possible). The assessment found that this program 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 Fall 2007:**
• 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: All meetings conducted by the NRC regarding the independent assessment of NASA's fundamental aeronautics research were completed in 2007. Preliminary report is estimated for release in March 2008.
• 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, & 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. PA&E has conducted an initial survey of other federal agencies' budget and performance documentation to identify parties of interest for benchmarking. Planned benchmarking activities in the first quarter of FY08 are with the Nat'l Cancer Institute's Off. of Science Planning and Assessment, the Off. of Director of Nat'l Intelligence and Off. of Strategic Planning & Performance Mgmt at Treasury.

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 Constellation Systems Theme received a FY 2006 PART rating of "Adequate." The rating reflected a strong ability to convey the program's purpose and design, combined with a low rating in program accountability 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 Fall 2007:**
• Conduct planned internal reviews.	• Action taken; expected completion date 9/30/2008: In Q2 of FY07, Constellation progressed through all of the Constellation projects SRR's (CLV, CEV, Mission Operations, Ground Operations, and EVA). The next internal reviews are SDR (Systems Definition Review) scheduled to begin Q4 of FY07 and finish by Q3 of FY08 will all projects. PDR (Preliminary Design Review) for the Constellation Program is scheduled for completion by Q4 of FY08.
• Plan and conduct comprehensive external program review.	• Action taken; expected completion date 9/30/2008: NASA has implemented a plan for external evaluation of the Constellation Systems of sufficient independence, scope, and quality with the Standing Review Boards evaluating NASA's performance throughout the design life cycle or the Program and projects. In addition, the National Academy of Science is being considered as a potential external review body however nothing has been implemented to date.
• 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 & assets from Space Operations to Constellations Systems are under development. The Program is working closely w/ 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 2007 PART review of the Advanced Capabilities Theme's constituent programs, Exploration Technology Development and Human Research, resulted in an rating of "Adequate." The evaluation validated that the 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. Note: Prior to the FY 2008 Budget Estimates, the work associated with Advanced Capabilities was budgeted under two Themes, Human Systems Research and Technology (HSRT) and Exploration Systems Research and Technology (ESRT). HSRT underwent PART assessment in 2005 (see below); ESRT was not assessed.			
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:	**Actions as of Fall 2007:**
• 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.	• Action taken; expected completion date 9/30/2008: The Aeronautics and Space Engineering Board of the National Research Council (NRC) has formed a committee to perform an independent assessment of NASA's restructured Exploration Technology Development Program (ETDP). Details of the committee charter and scope of work can be found at: http://www8.nationalacademies.org/cp/projectview.aspx?key=48849. The NRC plans to issue an interim report of its findings in March 2008.

• 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.	• Action taken; expected completion date 9/30/2008: The Human Research Program has reviewed or is in the process of reviewing all the directed research projects using Non-Advocate Review Panels. The Institute of Medicine of the National Academies will review the "NASA Research on Human Health Risks" starting January 2008 (anticipated completion date June 2008). Independent Program Implementation Review will be completed August 2008.
• Establish means to maximize return on available resources, metrics to measure efficiencies gained, and demonstrate improved efficiencies for Space Radiation Research Facility.	• Action taken; expected completion date 12/31/2010: NASA established an efficiency baseline for measurement on the research throughput of the Space Radiation Research Facility 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 a performance improvement action for several years as the Agency assures this is tracked and achieved.
• 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 12/31/2009: This will be an on-going set of activities with participation of multiple NASA organizations. PA&E has conducted an initial survey of other federal agencies' budget and performance documentation to identify parties of interest for benchmarking. Planned benchmarking activities in the first quarter of FY08 are with the National Cancer Institute's Office of Science Planning and Assessment, the Office of Director of National Intelligence and Office of Strategic Planning and Performance Management at Treasury.

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:	**Actions as of Fall 2007:**
• Return the Shuttle safely to flight and continue using it to support the Space Station.	• 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 3/31/2008: 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.
• Improve NASA's financial management system to eliminate the agency's four ongoing material weaknesses and to comply with the Federal Financial Management Improvement Act.	• Inactive: OMB to transfer this plan out of the Space Shuttle reporting section. The intent of this performance improvement plan was recaptured by the Agency and OMB in the 2006 review of the Integrated Enterprise Management Program. It will no longer be tracked under the Space Shuttle Program.

Theme: International Space Station

Last Year Assessed: 2004		**Rating:** Moderately Effective	
Program Purpose and Design: 100%	**Strategic Planning:** 100%	**Program Management:** 88%	**Program Results/ Accountability:** 47%

Rating Rationale: The International Space Station Program received an FY 2004 PART rating of "Moderately Effective." 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. The program will receive a full PART review in calendar year 2008.

Previous Year Assessed: 2003		*Rating: Results Not Demonstrated*	
Program Purpose and Design: 100%	*Strategic Planning: 78%*	*Program Management: 100%*	*Program Results/ Accountability: 26%*

Program Improvement Plan:	**Actions as of Fall 2007:**
• Develop alternatives to the Space Shuttle for resupplying the International Space Station.	• Action taken; expected completion date 7/01/2010: 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. 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.
• Hold program managers accountable for cost, schedule, and performance results and demonstrate that the program is achieving its annual performance goals.	• Completed: SOMD specific program management practices have been in place for several years that incorporate leading industry and government practices. Program management practices are reviewed quarterly. The ISS Program monitors contractor and International Partners progress, technical performance, actions, risk, cost, and schedule through regularly scheduled unilateral and multi-lateral reviews, audits, technical interchange meetings, boards, and panels.

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 Space and Flight Support (SFS) Theme's 2007 PART rating of "Moderately Effective" is an improvement over its original FY 2004 PART rating of "Adequate." 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:	**Actions as of Fall 2007:**
• Continue to fund the program at an essentially flat level, but strive to improve the program's results by increasing efficiency.	• 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.
• Develop better measures that will help to drive program improvement.	• Completed: We revisited the Crew Health and Safety metrics to get better aligned. Space and Flight Support was PARTed last year and developed new measures and metrics.

• 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 them post-Shuttle retirement. However, there are some KSC/Shuttle assets such as the com infrastructure and propellant servicing equipment that could impose cost impacts to LSP. Potential impacts remain unclear until CX 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. We do not expect reduced demand for SFS programs.
• 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: 2007		**Rating:** Results Not Demonstrated	
Program Purpose and Design: 100%	**Strategic Planning:** 88%	**Program Management:** 60%	**Program Results/ Accountability:** 33%

Rating Rationale: NASA's Education Theme received a 2007 PART rating of "Results Not Demonstrated." Many positive attributes were cited and it was concluded that the Theme attracts students to science and technology careers at NASA. On the other hand, it was cited that NASA lacked complete data on the effectiveness of its Education programs. The Theme did not have sufficient data to document the extent to which participants had taken jobs with NASA or related fields. It did not report on a complete set of performance measures that reflected the desired program Outcomes.

Previous Year Assessed: 2004		*Rating: Adequate*	
Program Purpose and Design: 100%	*Strategic Planning: 75%*	*Program Management: 40%*	*Program Results/ Accountability: 40%*

Program Improvement Plan:	**Actions as of Fall 2007:**
• Collecting performance data consistently and annually for all program activities, reporting performance against the program's established metrics and targets, and using results to improve performance.	• Action taken; expected completion date 9/30/2010: NASA created an evaluation function and budget to improve data collection processes. The CIO is contracted to develop an education data system to replace 3 existing databases. Concomitant with the data system design, a business process analysis is being conducted to document data collection requirements and ensure reliable data are routinely collected and reported for all projects. Quarterly reviews of data collection and progress of projects are conducted by Education senior leadership.
• 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: Pursuant to the OMB-approved evaluation plan, solicitation is underway for independent contractor with broad, deep expertise in STEM education evaluation. Under task orders, contractor will conduct objective, reliable, and valid evaluations of project effectiveness. Office is reviewing recommendations from National Academies study and will begin adjusting programming beginning in FY08 based on recommendations. 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: All FY07 higher education solicitations (Space Grant, EPSCoR, GSRP, etc.) specifically map to, and require research on, current mission directorate science and engineering priorities. Contracted OPM TMAT 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.
• Filling NASA's workforce needs using a stronger effort to consider eligible program participants and facilitate their entry into positions at NASA.	• Action taken; expected completion date 9/30/2010: MOU between Offices of Human Capital Management, Diversity and Equal Opportunity, and Education created to facilitate student movement into workforce. Activities include development of student opportunity brochure completed; draft policy revisions for internship and co-op conversion, development of database linking NASA Competency needs and degrees offered at universities, consolidated website for Internship/Fellowship application process, employment, and hiring opportunities.
• Establishing baselines for all performance metrics.	• Completed: FY07 baselines for all measures established and documented in PART Web (11/07).
• 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 Exploration Vision. 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. Hired portfolio manager, and ECC analyzed portfolio, to be complete by 03/08. 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. Portfolio analysis indicated need for HS pipeline program. Internal review of Academy projects and independent benchmark study conducted. ECC approved Inspire implementation plan.

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 Integrated Enterprise Management Program received a FY 2006 PART rating of "Moderately Effective." 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: None	**Rating:** N/A
Theme: Strategic Capabilities Assets Program	
Last Year Assessed: None	**Rating:** N/A