Message from the Administrator

November 15, 2011

I am pleased to present NASA's fiscal year (FY) 2011 Performance and Accountability Report (PAR). This report allows us to share our FY 2011 successes and setbacks with the American people as we strive to achieve our Mission. The performance and financial information in the PAR also provides valuable insight into our stewardship of taxpayer dollars and the resources entrusted to NASA.

FY 2011 was a year of remarkable change for NASA. As we closed the door on 30 years of Space Shuttle flights, we opened the door to a new era of exploration and took our critical first steps on that path. We unveiled a new Strategic Plan with NASA's new Vision and long-term goals to guide our activities and priorities over the next decade while continuing our commitment to NASA's core values of Safety, Integrity, Teamwork, and Excellence.

This year, we turned a page in space exploration history as we said a heartfelt farewell to the Space Shuttle. Between the first launch on April 12, 1981, and the final landing on July 21, 2011, NASA's Space Shuttle fleet—*Columbia*, *Challenger*, *Discovery*, *Atlantis*, and *Endeavour*—flew 135 missions, helped construct the International Space Station (ISS), and inspired generations. The orbiters *Discovery*, *Atlantis*, and *Endeavour* are undergoing preparations to be delivered to museums across the country, where they will continue to inspire the next generation of explorers and remind us of what the vision and dedication of a Nation can accomplish.

Retiring the most recognizable icon of U.S. space exploration was not an easy decision, but it was the right one. The time has come for us to set our sights on a new era of exploration. We are stimulating efforts within the private sector and paving the way for a robust U.S. commercial capability to take both crew and cargo safely to the ISS and low Earth orbit. Our commercial partners are making substantial progress as evidenced by the successful orbital test of the Dragon capsule on the Falcon 9 rocket in December 2010, which is a key milestone toward the spacecraft rendezvousing with the ISS in the next year.

While the commercial sector is focused on low Earth orbit access, we have set our sights on a new space exploration system that will take humans far beyond Earth. In September 2011, we selected the design for this new space exploration system—a heavy-lift rocket that will be America's most powerful since the Saturn V rocket that carried Apollo astronauts to the Moon. The Space Launch System (SLS) will be able to launch humans to asteroids, Mars, and other deep space destinations. This critical design decision will create jobs here at home and provide the cornerstone for America's future human space exploration efforts.

Space exploration is not just about innovation and discovery, it is a story of perseverance. Often, it takes years to watch a project come to fruition—but the rewards are well worth the wait. NASA's scientific discoveries just keep coming and coming, based on that perseverance. In September 2007, we launched the Dawn spacecraft to the asteroid belt between Mars and Jupiter to learn more about the two largest asteroids, Vesta and Ceres, after more than five years since Dawn was selected as a mission. In July 2011, after a journey of more than a billion miles, and more than three and a half years, Dawn achieved orbit around Vesta. With a diameter of 330 miles (530 kilometers), Vesta is the second most massive object in the asteroid belt, second only to Ceres. Dawn will orbit Vesta for a year before moving on to Ceres. Dawn's science instruments will measure surface composition, topography, and texture. Dawn will also measure the tug of gravity from Vesta and Ceres to learn more about their internal structures. Studying these two giant asteroids will not only help scientists unlock the secrets of our solar system's early history, but it will also provide us with valuable information for the future exploration of these bodies and greater insight into how we might address any asteroids that pose a threat to Earth.

We are proud of the progress we made this year. You will find highlights of our programmatic and fiscal activities in the Management's Discussion and Analysis section of this report. However, I encourage you to read the Detailed Performance section to learn more about our successes and setbacks. For the setbacks, you will find detailed information on the causes and what we plan to do to get back on track. I also encourage you to peruse the Financials section of this report, to get a better understanding of how we are managing our resources—your tax dollars. Included in that section are letters and reports from our external auditors and our Inspector General that speak to our progress.

NASA makes every effort to ensure that performance data are subject to the same attention to detail as is devoted to our scientific and technical research. With this in mind, I can provide reasonable assurance that the performance data in this report are reliable and complete. Any data limitations are documented explicitly in the report.

In addition, NASA accepts the responsibility of accounting for and reporting on its financial activities. During FY 2011, NASA received an unqualified "clean" opinion on its financial statements. This significant achievement resulted from the efforts of dedicated personnel across the Agency, a sound system of financial controls, and adherence to our Comprehensive Compliance Strategy and Continuous Monitoring Program. In addition, we continue to be in substantial compliance with the Federal Financial Management Improvement Act. Based on the results of this year's efforts, I am able to provide reasonable assurance that this report's financial data are reliable and complete.

To meet national needs, President Barack Obama has given NASA and our partners a grand challenge to out-innovate, out-educate, and out-build our competitors, and to create new capabilities that will take us farther into the solar system while learning about our place in it. Our accomplishments this year herald our progress toward meeting this grand challenge. The hard work, expertise, and dedication of NASA's employees and partners have enabled us to come this far, and will be critical as we continue to do the big things only NASA can do and challenge ourselves as a people to reach our highest potential. As we close this fiscal year and begin another, we will continue our commitment to being an exceptional resource for exploration, innovation, discovery, and education for this Nation, and we look forward to the challenges and opportunities that the next year will bring us.

Charles F. Bolden, Jr.
Administrator

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Management's Discussion and Analysis

Photo, previous page: The bright Sun, a portion of the International Space Station, and Earth's horizon are featured in this image photographed during the STS-134 mission's fourth spacewalk in May 2011. The image was taken using a fish-eye lens attached to an electronic still camera. (Credit: NASA)

Fiscal Year 2011

Welcome to NASA

NASA was created by the National Aeronautics and Space Act of 1958 to provide for research into problems of flight within and outside the Earth's atmosphere and to ensure that the United States conducts activities in space devoted to peaceful purposes for the benefit of mankind. In 2010, the President unveiled an ambitious new direction for NASA, laying the groundwork for a sustainable program of exploration and innovation. Called the National Space Policy, this direction extends the life of the International Space Station (ISS), supports the growing commercial space industry, and addresses important scientific challenges. It also continues NASA's commitment to robust human space exploration, science, and aeronautics programs. Later in 2010, Congress passed the NASA Authorization Act of 2010, which provided the Agency important guidance on program content and conduct.

On February 14, 2011, NASA released a new Strategic Plan that embraces the spirit, principles, and objectives of this and other recent policies and legislation.[1] The plan introduced a new framework for outlining NASA's strategic direction.

The NASA Vision

To reach for new heights and reveal the unknown, so that what we do and learn will benefit all humankind.

The NASA Mission

Drive advances in science, technology, and exploration to enhance knowledge, education, innovation, economic vitality, and stewardship of Earth.

The plan included a Vision statement[2] and a new Mission statement.

The following overarching strategies, as defined in the 2011 Strategic Plan, govern the management and conduct of NASA's aeronautics and space programs. These are standard practices that each organization employs in developing and executing their plans to achieve the Agency's strategic goals and annual performance plan. They also provide a framework that guides the way NASA supports other areas of national and Administration policy: government transparency; science, technology, engineering, and mathematics (STEM) education; energy and climate change; innovation; and increased citizen and partnership participation to help address challenges faced by the Nation.

- **Investing in next-generation technologies** and approaches to spur innovation;
- **Inspiring students** to be the future scientists, engineers, explorers, and educators through interactions with NASA's people, missions, research, and facilities;
- **Expanding partnerships** with international, intergovernmental, academic, industrial, and entrepreneurial communities and recognizing their role as important contributors of skill and creativity to NASA's missions and for the propagation of NASA's results;

1. In 2006, the Administration published the National Aeronautics Research and Development Policy, guiding the Nation's goals in aeronautics technology research and development.
2. Although NASA has had Vision statements in the past, for the 2006 Strategic Plan NASA senior management chose to not include a Vision statement.

- **Committing to environmental stewardship** through Earth observation and science, and the development and use of green technologies and capabilities in NASA missions and facilities; and
- **Securing the public trust** through transparency and accountability in NASA's programmatic and financial management, procurement, and reporting practices.

NASA's Organization

NASA's science, research, and technology development work is focused and implemented through three mission directorates and assisted by the mission support directorate. Additionally, NASA has three offices that directly support NASA's Mission and Vision.

The **Aeronautics Research Mission Directorate (ARMD)** explores early-stage concepts and ideas, develops new technologies and operational procedures through foundational research, and demonstrates the potential of promising new vehicles, operations, and safety technology in relevant environments. ARMD is focused on cutting-edge research and technologies to overcome a wide range of aeronautics challenges for the Nation's current and future air transportation system.

The **Human Exploration and Operations (HEO) Mission Directorate** was newly formed in August 2011. It merged the Exploration Systems and Space Operations Mission Directorates, creating an organization dedicated to enabling human and robotic space exploration. HEO operates the International Space Station and is developing technologies and capabilities for human exploration beyond low Earth orbit. It manages the commercial crew and cargo developmental programs, construction of the Orion Multi-Purpose Crew Vehicle, development of a new heavy lift rocket known as the Space Launch System, launch operations, space communications, rocket propulsion testing, human health and safety, and exploration technology development, the latter to enable human exploration of deep space.

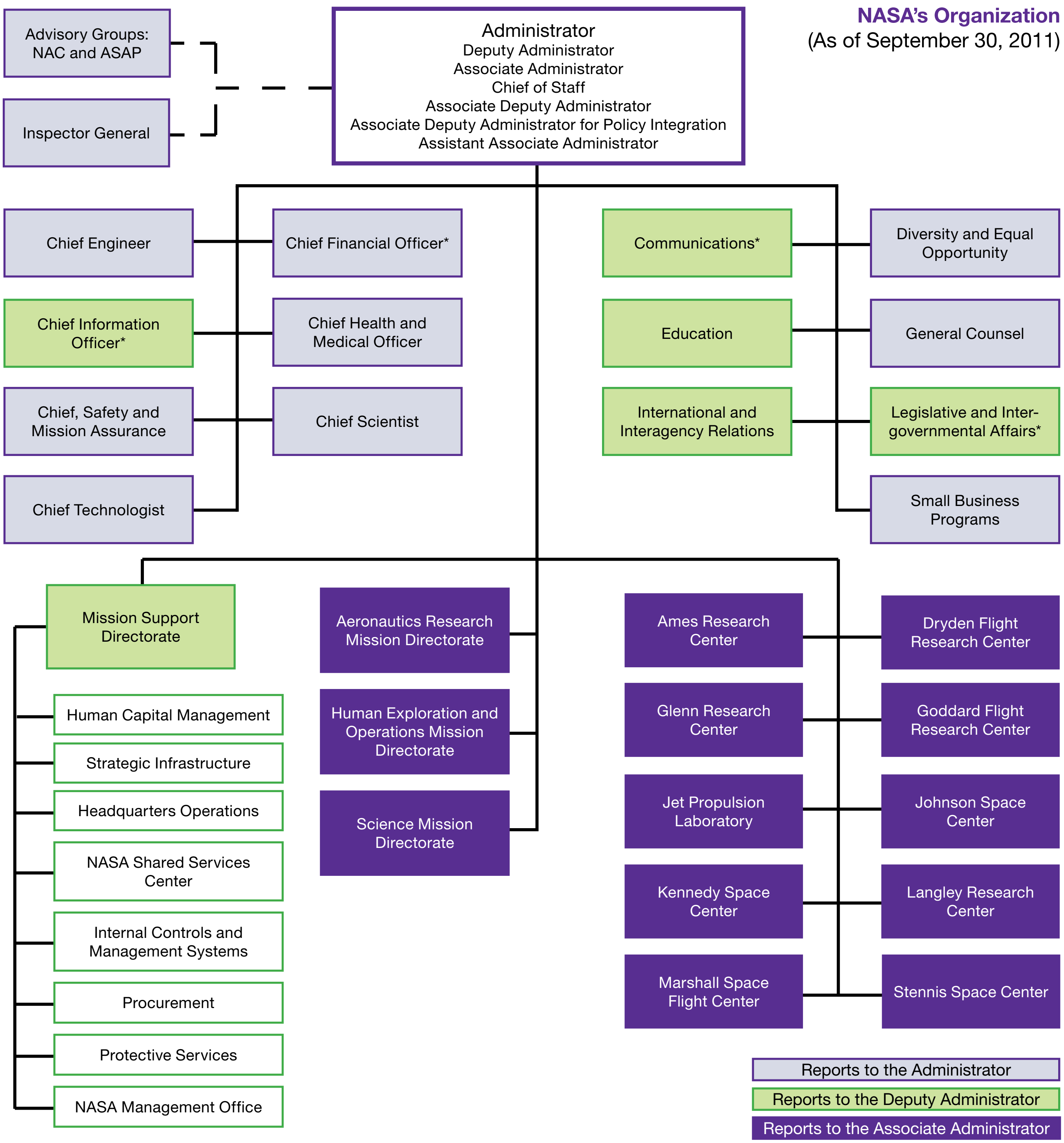
The **Science Mission Directorate (SMD)** conducts the scientific exploration of Earth, the Sun, the solar system, and the universe. SMD's missions include ground-, air-, and space-based observatories, deep-space automated spacecraft, planetary orbiters, landers, and surface rovers. SMD also develops innovative science instruments and techniques in pursuit of NASA's science goals.

The **Mission Support Directorate (MSD)** strengthens the efficiency and management of Agency-level operations under a single associate administrator. MSD includes Agency and Center management and operations, facility construction, budget and finance, information technology, human capital management, and infrastructure. Organizing NASA's mission support services into a mission directorate ensures that management practices are uniform across the Agency and that these support services maintain maximum visibility inside and outside the Agency.

The **Office of Education (Education)** is responsible for developing and managing a portfolio of programs that translate NASA's mission focus and achievements into educational activities, tools, and opportunities for students and teachers at all levels. Education's goals are to strengthen the future workforce for the benefit of NASA and the Nation, attract and retain students in STEM disciplines, and engage the public in NASA's missions. To achieve these goals, Education partners with other government agencies, non-profit organizations, museums and education centers, and the education community at large.

The **Office of the Chief Technologist (OCT)** is the principal advisor and advocate on matters concerning Agency-wide technology policy and programs. OCT directly manages NASA's Space Technology programs and coordinates and tracks all technology investments across the Agency.

The **Office of the Chief Scientist** is the principal advisor and advocate on Agency science programs, strategic planning, and the evaluation of related investments. The Office of the Chief Scientist represents the scientific endeavors in the Agency, ensuring they are aligned with and fulfill the Administration's science objectives.

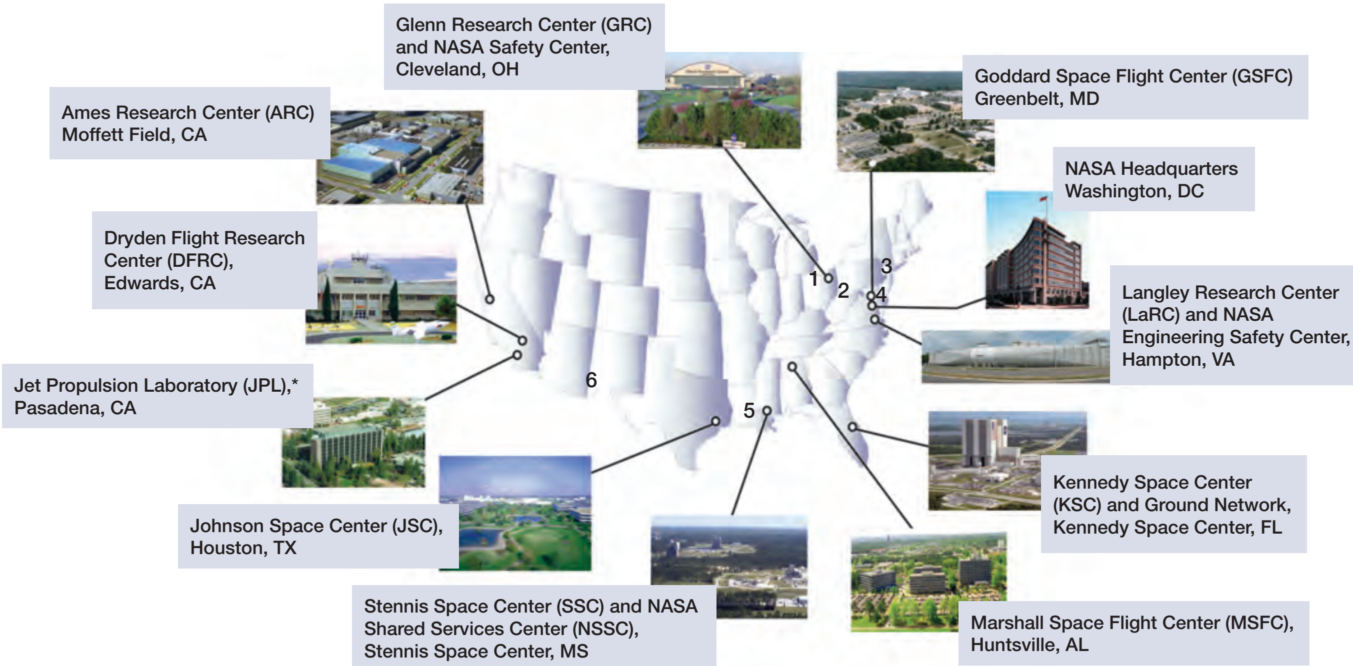


*Center functional office directors report to Agency functional Associate Administrators. Deputy and below report to Center leadership. Dashed lines indicate independent organizations that report to the Administrator.

The Administrator's Staff Offices provide a range of high-level guidance and support in critical areas like safety and mission assurance, technology planning, education, equal opportunity, information technology, financial administration, small business administration, international relations, and legislative and intergovernmental affairs.

NASA is comprised of Headquarters in Washington, DC, nine Centers located around the country, and the Jet Propulsion Laboratory, a federally funded research and development center (FFRDC) operated under a contract with the California Institute of Technology. In addition, NASA partners with academia, the private sector, state and local governments, other Federal agencies, and a number of international organizations to create an extended NASA family.

NASA Centers and Facilities Nationwide



*The Jet Propulsion Laboratory is an FFRDC. The workforce are employees of the California Institute of Technology.

Other NASA facilities noted on the map by number include: 1) Plum Brook Station, Sandusky, OH, managed by GRC; 2) Software Independent Verification and Validation Facility, Fairmont, WV, managed by GSFC; 3) Goddard Institute for Space Studies, New York, NY, managed by GSFC; 4) Wallops Flight Facility, Wallops, VA, managed by GSFC; 5) Michoud Assembly Facility, New Orleans, LA, managed by MSFC; and 6) White Sands Test Facility and Space Network, White Sands, NM, managed by JSC.

For more information about NASA's organization go to http://www.nasa.gov/about/org_index.html.

NASA's Workforce

As of August 18, 2011, NASA employed more than 18,500 on-duty civil servants (full-time, part-time, term appointment, student and other non-permanent) at nine Centers, Headquarters, and the NASA Shared Services Center, with approximately 5,000 people at the Jet Propulsion Laboratory. To see more information about workforce profile and distribution, visit the Workforce Information Cubes for NASA at http://wicn.nssc.nasa.gov/.

This year, the Office of Human Capital Management (OHCM) released a Workforce Plan that outlines the policies, processes, and structures needed to ensure that critical workforce skills and capabilities are available and effectively used in the timeframe needed to enact the major activities of the Agency's Mission. The 2011 Workforce Plan has an overarching strategic workforce goal—identify, acquire, and sustain the workforce needed to successfully conduct NASA's current and future missions—supported by five workforce goals:

- **Workforce Goal 1:** Plan strategic human capital and position for mission success—Analyze, develop policy, conduct organizational design and resource alignment to guide NASA's multi-sector workforce.
- **Workforce Goal 2:** Recruit and employ a highly qualified, diverse workforce—Identify, attract, and employ a diverse workforce with the right skills, at the right time, at the right place.
- **Workforce Goal 3:** Train and develop talent—Create and conduct training and development initiatives that address today's and tomorrow's needs and enable mission success.
- **Workforce Goal 4:** Sustain a high-performing workforce—Enable managers to sustain an environment conducive to workforce productivity, innovation and effectiveness.
- **Workforce Goal 5:** Enable efficient human capital services—Develop effective human resources programs supported by comprehensive, timely, and validated information.

OHCM will revise the Workforce Plan to support NASA's evolving strategic direction and priorities and changing workforce needs.

Shared Values, Shared Results

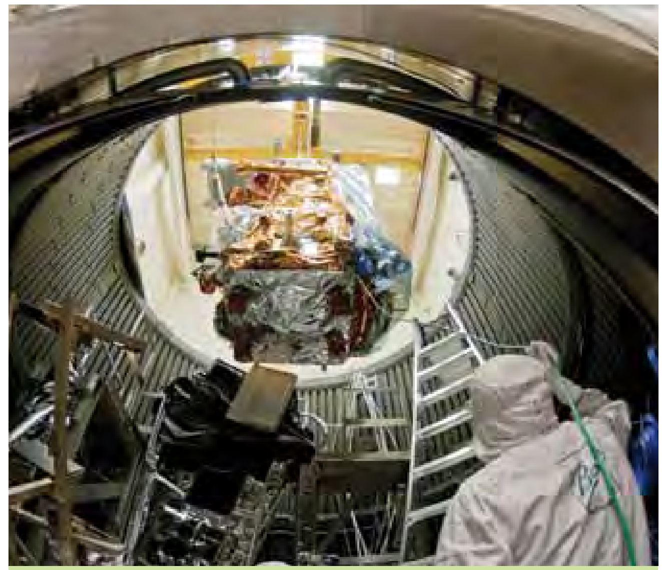
NASA believes that mission success is the natural outcome of an uncompromising commitment to the Agency's four shared core values: safety, integrity, teamwork, and excellence.

Safety: Constant attention to safety is the cornerstone of mission success. NASA is committed, individually and as a team, to protecting the safety and health of the public, NASA team members, and the assets that the Nation entrusts to the Agency.

Integrity: NASA is committed to maintaining an environment of trust, built on honesty, ethical behavior, respect, and candor. Agency leaders enable this environment by encouraging and rewarding a vigorous, open flow of communication on all issues, in all directions, and among all employees without fear of reprisal. Building trust through ethical conduct as individuals and as an organization is a necessary component of mission success.

Teamwork: NASA's most powerful tool for achieving mission success is a multi-disciplinary team of diverse, competent people across all NASA Centers. NASA's approach to teamwork is based on a philosophy that each team member brings unique experience and important expertise to project issues. Recognition of, and openness to, that insight of individual team members improves the likelihood of identifying and resolving challenges to safety and mission success. NASA is committed to creating an environment that fosters teamwork and processes that support equal opportunity, collaboration, continuous learning, and openness to innovation and new ideas.

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



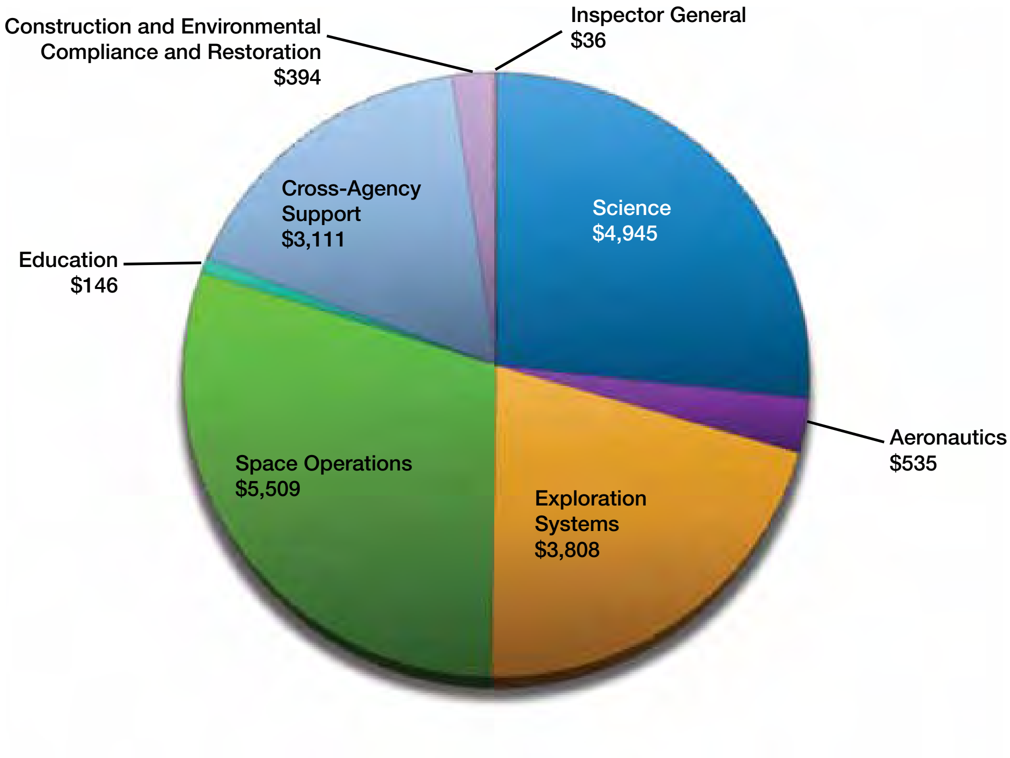
An engineer from Ball Aerospace guides the NPOESS Preparatory Project (NPP) satellite into a thermal vacuum chamber for environmental testing. Once the satellite is inside, the air is pumped out of the chamber and temperature extremes are applied to replicate orbit conditions. Completing a project like NPP requires dedication, teamwork, and attention to detail from all participants—NASA, contractors, and partners. (Credit: Ball Aerospace)

Budget for Performance: NASA's FY 2011 Budget

On April 15, 2011, President Barack Obama signed into law a full-year continuing resolution (CR) for fiscal year 2011.[1] Congress uses CRs to continue funding government functions if an appropriations bill has not been signed into law by the end of the fiscal year. This authorizes agencies to fund their programs at the existing or a reduced level, until either the resolution expires, or an appropriations bill is passed.

The 2011 CR, which gave NASA $18,485 million for the fiscal year, directed NASA to pursue the human exploration goals set in the NASA Authorization Act of 2010 and called for the development of the Space Launch System and a Multi-Purpose Crew Vehicle. The chart below shows the details of the CR by each of NASA's appropriation accounts.[2]

Full-Year Continuing Appropriations Act of 2011, Total $18,485
(Dollars in Millions)



Note: NASA merged Exploration Systems and Space Operations into a new, single organization, Human Exploration and Operations, later in the fiscal year.

NASA's budget requests are available online at http://www.nasa.gov/news/budget/index.html.

1. Department of Defense and Full-Year Continuing Appropriations Act of 2011 (P.L. 112-10).
2. In the FY 2011 Budget Request, NASA requested that an appropriation account be created for Aeronautics and Space Technology, which would fund both aeronautics and space research and technology activities. Under the year-long CR, the activities associated with space research and technology remained in existing accounts, and NASA began new Space Technology initiatives in the Space Operations account. These initiatives are guided by the Office of the Chief Technologist.

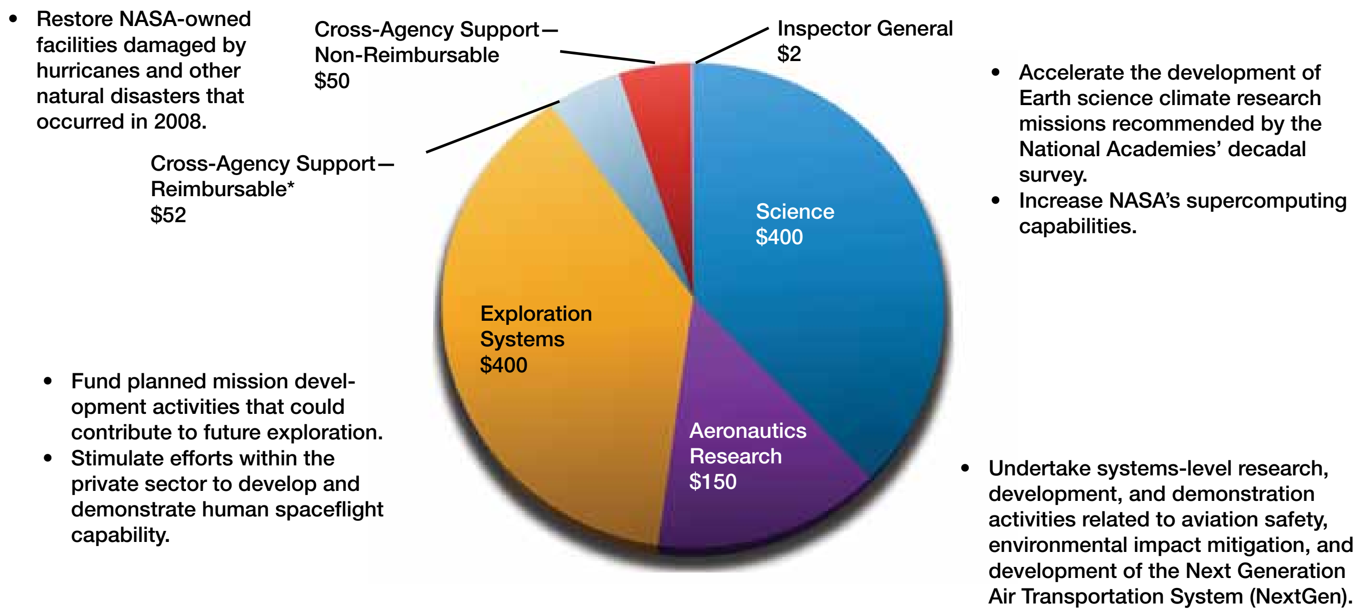
Continuing Performance on the Implementation of the American Recovery and Reinvestment Act

The American Recovery and Reinvestment Act of 2009 (Recovery Act) was signed into law by President Obama, on February 17, 2009. It was an unprecedented effort to jump-start the Nation's economy by creating and saving jobs and investing in long-term growth, while holding the Federal government to levels of accountability and transparency in spending,

NASA received $1,050 million of Recovery Act funding in FY 2009 ($1,002 million Direct Appropriation and $48 million Reimbursable Authority), all of which was obligated to projects to support the Nation's economic recovery and advance NASA's research mission. The Agency received an additional $4 million in Recovery Act Reimbursable Authority in FY 2010. NASA provides an overview of the Recovery Act and NASA's implementation efforts at http://www.nasa.gov/recovery/index.html.

Since the Recovery Act was signed into law, NASA leveraged its funding to achieve the purposes set forth by this important law. NASA's Recovery Act funds augmented research and development activities in the key program areas of Aeronautics Research, Science (with an emphasis on Earth Science and Astrophysics), and Exploration and were used to restore critical NASA-owned facilities damaged from hurricanes during 2008.

NASA Recovery Act Funding Total: $1,054
(Dollars in Millions)



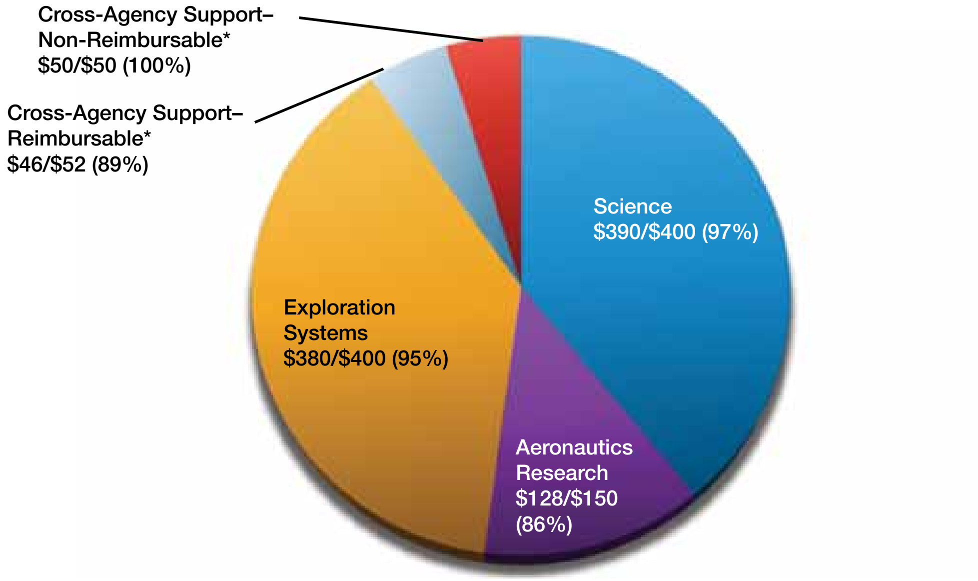
*Reimbursable activities for other Federal agencies' Recovery Act programs.

Highlights of NASA's investments included:

- Undertaking systems-level research, development and demonstration activities related to aviation safety, environmental impact mitigation, and Next Generation Air Transportation System (NextGen) activities;
- Accelerating development of Tier 1 Earth science climate research missions recommended by the National Academies' decadal survey;
- Increasing the Agency's supercomputing capabilities; and
- Stimulating efforts within the private sector to develop and demonstrate technologies that enable commercial human spaceflight capabilities.

In FY 2011, NASA effectively spent the money entrusted to the Agency by Congress by completing the majority of planned work. As of September 30, 2011, NASA has disbursed over $994 million (94 percent) of its Recovery Act funds available through September 30, 2010 (shown in the chart below). Also of note, NASA contractors and grantees have completed an additional $33.5 million of work to bring the total expenditure to 97.5 percent of the Recovery Act funds. NASA expects to complete the remaining Recovery Act activities by September 30, 2013. The Inspector General funds are not included in the chart below as these amounts are available through September 30, 2013.

NASA Recovery Act Disbursed Total: $994/$1,054, 94%*
(Dollars in Millions)



*Ratio compares disbursed amounts to total available resources.

Recovery Act funding supports instrumentation for NASA's IceBridge mission

In 2009, the Center for Remote Sensing of Ice Sheets (CReSIS) at the University of Kansas received Recovery Act funds to participate in NASA's IceBridge mission by helping to provide four specialized radars for the aircraft flying the mission. IceBridge, the largest airborne survey of Earth's polar ice ever flown, is monitoring polar regions with instrumented aircraft until the launch of ICESat-II.

CReSIS developed a radar instrumentation package in less than six months and deployed it on NASA's aircraft. IceBridge used the resulting systems during the 2010 and 2011 deployments to Greenland. The CReSIS team perform measurements in conjunction with laser surface elevation measurements being performed by NASA Centers. Scientists around the world are using the data collected by the instrumentation to improve ice-sheet models. This project provided an excellent opportunity to train both graduate and undergraduate students in a multidisciplinary design environment, and provided them an avenue to learn rapid prototyping and development of hardware that must conform to aircraft certification standards. The project involved a local industry in the development process and also has enabled other joint projects that include local industry.

An aerospace engineering student at CReSIS (top) had the opportunity to see the development progress for the fuselage-mounted Multichannel Coherent Radar Depth Sounder (MCoRDS) instrument from a computer aided structural design to the actual installation on the aircraft. The photo below shows MCoRDS being installed at NASA's Wallops Flight Facility. (Credit, top: CReSIS; below: NASA)

Performance Results

NASA has a culture of performance and data-driven performance management, as periodically recognized by Congress, the Government Accountability Office, and the Office of Management and Budget. In recent years, the Agency has worked hard to improve its performance management system to increase accountability, transparency, and oversight. NASA continues to add sophistication and discipline to this system, leading to more consistent performance results across NASA's missions and to make the best use of the resources entrusted to the Agency by Congress and the American people.

In FY 2011, NASA said farewell to the Space Shuttle and continues to look forward to future years of performance in all program areas: aeronautics, science, and human space flight. Shortly after the last flight, Administrator Bolden announced a launch vehicle design for a new deep space exploration system to follow the Space Shuttle. This new heavy-lift rocket will be America's most powerful since the Saturn V rocket, which carried Apollo astronauts to the Moon, and it will launch humans to explore new deep-space destinations like asteroids, Mars, and its moons.

The Agency also unveiled six new strategic goals that emphasize the cooperative, cross cutting nature of NASA's missions and operations. They focus on the valued contributions of NASA's science and exploration missions, as well as aeronautic and space technology research.

NASA made improvements to its performance management system with a new performance framework, based on the strategic goals, that uses a revised rating criteria to conduct quarterly reviews of performance goals (including high priority performance goals) and annual performance goals.

This Performance Results section presents:

- A tribute to NASA's Space Shuttle Program in recognition of its contribution to human exploration and in celebration of its successful retirement;
- NASA's new performance framework;
- An explanation of how NASA measures and manages its performance;
- A summary of NASA's performance against its FY 2011 goals;
- The FY 2011 cost toward its strategic goals;
- Performance highlights for each strategic goal; and
- A summary of verification and validation practices for assuring the integrity of NASA's performance data.

End of an Era, Dawn of a New Beginning

The Space Shuttle and Thirty Years of Performance

The Hubble Space Telescope. The International Space Station. The Galileo robotic Jupiter spacecraft. The Chandra X-ray Observatory. Each of these missions has one thing in common: they were made possible by the Space Shuttle. In its 30 years of operation, the Space Shuttle Program accomplished amazing things, advancing technology and affecting the lives of people across the globe.

The Space Shuttle Program was a remarkable chapter in America's history in space. The five orbiters, *Columbia*, *Challenger*, *Discovery*, *Atlantis*, and *Endeavour*, flew 135 times, carrying more than 360 people into space and traveling more than 500 million miles. The Space Shuttle Program was a core part of NASA's strategic plan for over three decades, and this amazing vehicle enabled NASA and the Nation to do great things in space.

NASA's Space Shuttle fleet began setting records with its first launch on April 12, 1981, and continued to set high marks of achievement and endurance through 30 years of missions. Starting with *Columbia* and continuing with *Challenger*, *Discovery*, *Atlantis*, and *Endeavour*, the Space Shuttle fleet carried people into orbit, launched, recovered and repaired satellites, conducted cutting-edge research and built the largest structure ever assembled in space, the International Space Station (ISS). The final Space Shuttle mission, STS-135, ended July 21, 2011, when *Atlantis* rolled to a safe stop at its home port, NASA's Kennedy Space Center in Florida.

In its 30 years of performance, crew members spent a total of 198,728.25 hours (approximately 8,280 days) on Space Shuttle, and deployed 179 payloads. They also returned 52 payloads from space back to Earth. Space Shuttle crews retrieved and repaired then re-deployed seven payloads, including the Hubble Space Telescope and the Solar Max satellite. The Shuttle docked with the *Mir* space station nine times, and with the International Space Station 36 times. The Space Shuttle launched over 4.4 million pounds of cargo mass into space and, unique to the Shuttle, returned almost 230,000 pounds of cargo back to Earth. Collectively, the orbiters spent a total of 1,310 days (31,440 hours, 59 minutes, 33 seconds) in space, orbiting Earth 20,830 times.

On April 12, 1981, a bird flies away from Launch Complex 39's Pad A as something new takes to the sky—America's reusable Space Transportation System (STS). Designated STS-1, Space Shuttle *Columbia* launches on its historic maiden voyage carrying astronauts John Young and Bob Crippen. (Credit: NASA)

In 2004, NASA was given two strategic goals for the Space Shuttle: complete assembly of the ISS and fly safely through their retirement. NASA has completed both these goals. As it did during the first three decades of Space Shuttle flight, the performance of the Space Shuttle Program has always reached for the greatest heights to deliver benefits to all humankind.

Designed to return to Earth and land like a hypersonic glider, the Space Shuttle was the first successful reusable space vehicle. The Space Shuttle pushed the boundaries of discovery ever farther, requiring not only advanced technologies but the tremendous effort of a dedicated nationwide workforce. Thousands of civil servants and contractors across the Nation at NASA's Centers have demonstrated an unwavering commitment to mission success and the greater goal of space exploration.

To this day, the Space Shuttle remains the fastest winged vehicle ever to fly, with an orbital velocity of 17,500 miles per hour, 10 times the speed of a high-powered rifle bullet. Additionally, the Space Shuttle carried cargos of substantial weight and dimensions and ultimately returned from orbit more than 97 percent of all mass returned to Earth.

In addition to the advances required for the spacecraft's development, science has made huge strides with the help of the Space Shuttle. NASA researchers have learned more about how human bodies and those of other organisms function, from the subcellular level on up. They have learned how people as individuals interact with one another under unusual and stressful circumstances—and how to work together. The Space Shuttle has revealed more about Earth, its land masses, oceans, atmosphere, and environment as a whole. It also has been instrumental in learning more about the Moon, the solar system, the Milky Way galaxy, and the universe. For example, Space Shuttle missions launched and repeatedly upgraded and repaired the Hubble Space Telescope, which has provided unprecedented vision of distant stars, some with planets orbiting them. It has allowed humankind to look at objects so distant that viewing the light from them is looking back in time to witness the beginning of the universe.

Astronaut Story Musgrave, anchored on Space Shuttle *Endeavour*'s robotic arm, prepares to be elevated to the top of the Hubble Space Telescope during Hubble's first servicing mission, in 1993. Astronaut Jeffrey Hoffman, inside the Shuttle payload bay, assists Musgrave. The mission replaced and repaired various instruments, but its most important task was installing technology that corrected the tiny flaw in Hubble's main mirror that distorted the telescope's view. (Credit: NASA)

Scientific advances continue aboard the ISS. Without the Space Shuttle, this orbiting research facility simply could not have been built. Perhaps as important as any element of the Space Shuttle legacy is the development of international cooperation in space. Humans from many nations have begun to work together in space. Space Shuttle visits to the Russian space station *Mir* were a beginning that led to the new cooperation we see today aboard the ISS. It has helped to develop understanding for people from many countries, including some former enemies. Such synergies will give humans as a whole greater potential for space exploration and development that any single nation could achieve alone. The Space Shuttle has provided inspiration—for the young and the not so young. It has encouraged uncounted young students to focus on science and technology. The idea of becoming an astronaut, as some certainly will, is a powerful motivation. So too is the prospect of using such an education to advance human knowledge and understanding in space. People of all the nations contributing to the Space Shuttle's design and operation can take pride in its accomplishments.

Now, the Space Shuttle ushers in the next extraordinary installment in the Nation's story of exploration. The Space Shuttle concluded its historic mission by completing construction of the ISS, the anchor of NASA's human space flight activities for the next decade. Six-member crews will be living and working aboard the ISS around the clock until at least 2020. The ISS will be the centerpiece of our human spaceflight activities for the coming years, and the research and technology breakthroughs aboard the ISS will facilitate our travel to destinations beyond low Earth orbit.

Workers measured and marked in bright red the letters "MLG" at the spot where Space Shuttle *Atlantis*' main landing gear came to rest after the vehicle's final return from space. Securing the Space Shuttle fleet's place in history on the STS-135 mission, *Atlantis* safely and successfully rounded out NASA's Space Shuttle Program on the Shuttle Landing Facility's Runway 15 at Kennedy Space Center in Florida. Main gear touchdown was at 5:57:00 a.m. EDT on July 21, 2011, followed by nose gear touchdown at 5:57:20 a.m., and wheel stop at 5:57:54 a.m. (Credit: NASA/K. Herring)

The Space Shuttle Program will continue to shape humankind's vision of exploration. The orbiters will live on in museums around the country, inspiring millions of visitors to look up and dream. Though the orbiters themselves will no longer fly, technology from the Space Shuttle will be used in the design of the Space Launch System, NASA's new deep space launch vehicle. The aspiring astronauts of today may not fly the Space Shuttle, but they may soon have the opportunity to walk on Mars.

On to 30 more years of NASA's performance in human space flight, science, aeronautics, and space technology development. . . .

Above: Vapor trails follow Space Shuttle *Atlantis* as it approaches Runway 15 at the Kennedy Space Center for the final time. *Atlantis* marked the 26th nighttime landing of the Space Shuttle and the 78th landing at Kennedy. It also was the final mission for the Space Shuttle Program. (Credit: NASA/S. Joseph and K. O'Connell)

A New Strategic Plan and Performance Framework

On February 14, 2011, NASA released a new Strategic Plan outlining six new strategic goals. For the first time the Agency has a strategic goal that emphasizes the importance of supporting the underlying capabilities that enable NASA's missions. This addition ensures that resource decisions directly address the balance of funding priorities between missions and the requirements of institutional and program capabilities that enable the missions.

At the heart of NASA's strategic goals remain the core missions of human space exploration, Earth and space science, aeronautics, and technology development. The 2011 Strategic Plan elevates the science and aeronautics missions from sub-goals to strategic goals and once again establishes education and outreach as fundamental Agency activities. NASA's new strategic goals are as follows:

- **Strategic Goal 1:** Extend and sustain human activities across the solar system.
- **Strategic Goal 2:** Expand scientific understanding of the Earth and the universe in which we live.
- **Strategic Goal 3:** Create the innovative new space technologies for our exploration, science, and economic future.
- **Strategic Goal 4:** Advance aeronautics research for societal benefit.
- **Strategic Goal 5:** Enable program and institutional capabilities to conduct NASA's aeronautics and space activities.
- **Strategic Goal 6:** Share NASA with the public, educators, and students to provide opportunities to participate in our Mission, foster innovation, and contribute to a strong national economy.

Changes to NASA's Performance Framework

NASA revised the performance framework supporting these strategic goals, as well, to increase transparency by providing more insight into the Agency's performance against its mid- and near-term plans. This new framework guided development of the FY 2011 Performance Plan being reported on in this document.

The former strategy-performance framework, was based on the 2006 Strategic Plan, and consisted of three levels: strategic goals (and sub-goals), outcomes, and annual performance goals (APGs). The new strategy-performance framework consists of four levels of performance measures, mapped to the strategic goals. The four distinct levels supporting the achievement of the overarching goals are outcomes, objectives, performance goals, and annual performance goals.

Each performance level is associated with a specific timeframe. In the past, the outcome level was associated by any timeframe beyond the annual. In the new framework outcomes reflect NASA's long-term plans for the next 10 to 20 years and beyond. Objectives identify targets that span the next 10 years. Performance goals focus on planned progress over the next two to five years, and include the high-priority performance goals. Lastly, annual performance goals (APGs) align to the annual budget request.

The figure below compares the former performance framework to the new one.

Changes to NASA's Rating Criteria and Rated Performance Measures

In FY 2011, NASA chose to pilot refined rating criteria and to rate only the performance goal (two- to five-year target) and APG (annual target) levels as a measurement improvement strategy. In the past, NASA rated the performance against the APGs and outcomes, the latter of which had an open-ended timeframe and, therefore, targets that potentially would never be accomplished fully. Outcomes continue to perform their intended function as long-term, larger scope steps toward achieving the strategic plans.

NASA measures and communicates its progress toward achieving performance goals and APGs through the ratings below. NASA determines these ratings based on a series of internal assessments that are part of ongoing monitoring of NASA's program and project performance. These ratings are then validated externally with entities such as scientific peer review committees, aeronautics technical evaluation bodies, and the Office of Management and Budget prior to provision in the Performance and Accountability Report.

FY 2011 Pilot Rating Criteria for Performance Goals

Rating	Performance Goal and High Priority Performance Goal
Green (On Track)	NASA achieved or expects to achieve the intent of the performance goal or high priority performance goal (HPPG) within the estimated timeframe. NASA achieved the majority of key activities supporting this performance goal or HPPG.
Yellow (At Risk)	NASA expects to achieve the intent of the performance goal or HPPG within the timeframe; however, there is at least one likely programmatic, cost, or schedule risk to achieving the performance goal or HPPG.
Red (Not on Track)	NASA does not expect to achieve this performance goal or HPPG within the estimated timeframe.
White (Canceled or Postponed)	NASA senior management canceled this performance goal and the Agency is no longer pursuing activities relevant to this performance goal or the program did not have activities relevant to the performance goal during the fiscal year.

FY 2011 Pilot Rating Criteria for APGs

<table>
<tr><th rowspan="2">Timeframe: When Will the APG Be Achieved</th><th colspan="3">Rating Criteria for APG Types</th><th rowspan="2">Rating</th></tr>
<tr><th>Single Milestone or Deliverable</th><th>Multiple Deliverables, Targeted Performance, and Efficiencies</th><th>On-going Activities, Services, or Management Processes</th></tr>
<tr><td>Current FY as planned.</td><td>NASA achieved the event or the deliverable met the intent of the APG within the timeframe.</td><td>The program/project reached the stated numeric target.</td><td>The intended result of the program/project was achieved as defined by internally held success criteria.</td><td>Green</td></tr>
<tr><td>Achieve next FY (will not achieve this FY as planned).</td><td colspan="3">NASA did not achieve this APG in the current fiscal year, but anticipates achieving it during the next fiscal year.</td><td rowspan="2">Yellow</td></tr>
<tr><td>Will not be achieved, but progress was made.</td><td>N/A</td><td>NASA failed to achieve this APG, but made significant progress as defined by reaching 80% of the target or other internally held success criteria.</td><td>The intended results of the program/project were not achieved in this fiscal year, but significant progress was accomplished, as defined by internally held success criteria.</td></tr>
<tr><td>Will not be achieved.</td><td>NASA did not achieve the APG and does not anticipate completing it within the next fiscal year.</td><td>NASA achieved less than 80% of the target or other internally held success criteria.</td><td>Neither intended results nor significant progress were achieved. The progress toward the APG does not meet standards for significant progress for the internally held success criteria.</td><td>Red</td></tr>
<tr><td>Will not be achieved due to cancellation or postponement.</td><td colspan="3">NASA senior management canceled this APG and the Agency is no longer pursuing activities relevant to this APG or the program did not have activities relevant to the APG during the fiscal year.</td><td>White</td></tr>
</table>

Managing and Measuring NASA's Performance

NASA's planning and performance management system is an essential part of strategic management and governance. The Agency has an integrated system to: plan strategy and implementation; monitor, assess, and evaluate performance toward commitments; identify issues; gauge the organization's health; and provide appropriate data and information to NASA decision-makers. NASA's performance data provides a foundation for both programmatic and institutional decision-making processes and supports decisions concerning strategy and budget.

NASA's performance system is designed to align with the Agency's internally and externally imposed performance measurement and reporting requirements, tools, and practices, including the Government Performance and Results Act Modernization Act (GPRAMA) of 2010 and Executive Orders 13450—Improving Government Program Performance and 13576—Delivering an Efficient, Effective, and Accountable Government.

NASA's planning and performance management system provides data to Agency management through the following: ongoing monthly and quarterly analyses and reviews; annual assessments in support of budget formulation (for budget guidance and issue identification, analysis and disposition); annual reporting of performance, management issues, and financial position; periodic, in-depth program or special purpose assessments; and recurring or special assessment reports to internal and external organizations.

Reviewing Performance at the Senior Management Level

For over four years, NASA has held the Baseline Performance Review, an Agency-level forum for discussing performance and issues chaired by the associate administrator, who also serves as the chief operating officer. Senior management at the mission directorate, program, project and Center-level present institutional, program and project performance. Actions are assigned accordingly to address any issues. Beginning in 2011, NASA initiated quarterly performance self-assessments for the execution year performance plan commitments (i.e., performance goals and APGs, and progress toward achieving high priority performance goals (HPPGs)). For HPPGs, the goal leaders present their progress overall, including progress towards milestones, risks, and coordination efforts. They also request senior management input if required to keep on track.

Measuring High Priority Performance Goals

Starting in FY 2010, NASA developed and began reporting on a quarterly basis for five HPPGs. In accordance with the GPRA Modernization Act of 2010 and a White House initiative for building a high-performing government, NASA's HPPGs represent challenging, near-term targets that the Agency will reach to benefit the American people in the areas of human exploration, earth science, aeronautics research, and energy management. These five performance goals were chosen by Administrator Bolden for their importance to both NASA's Mission and national priorities (see NASA's FY 2011 Progress Toward the High Priority Performance Goals for more information).

Setting Performance Improvement Plans

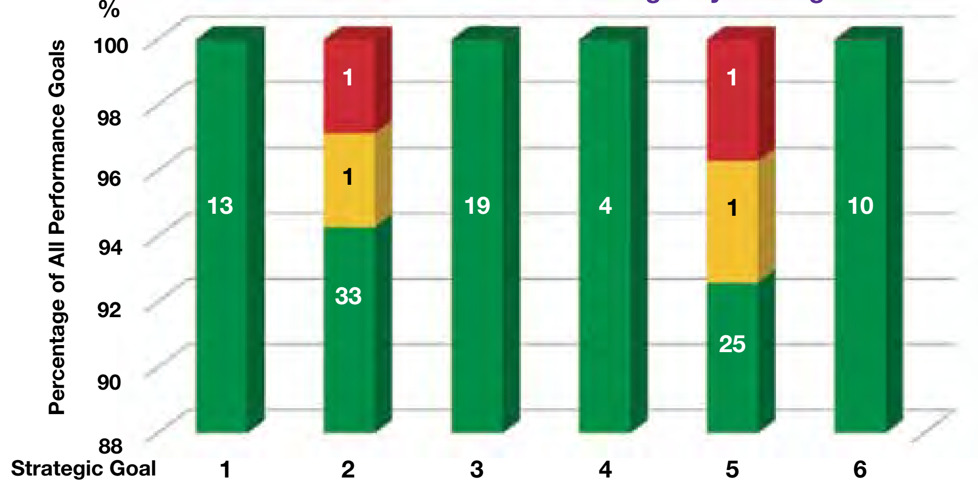
Performance shortfalls identified in FY 2011 can impact the success of activities in subsequent years. Hence, the final performance results reflected in this report will inform planning for the forthcoming FY 2012 Performance Plan and the FY 2013 Congressional Justification. NASA, along with the Government Accountability Office (GAO) and the Office of Inspector General (OIG) monitor the Agency's activities and results to identify weaknesses in or risk to performance. NASA assessed this year's performance shortfalls to project future impacts and to look for any trends across those shortfalls. Additionally, FY 2011 performance challenges were trended with those seen in FY 2010, to provide a more complete picture of what may be the causes for why NASA did not meet its performance targets. NASA couples the results from this and other internal performance assessments with the insights of OIG and GAO to inform actionable plans that strengthen the Agency. See the Performance Improvement Plan Introduction section of Detailed Performance (see page 155) for more details on the performance improvement plans resulting from this performance assessment.

Summary of Performance Results

In FY 2011, NASA rated 108 two- to five-year performance goals, including the five HPPGs, and 149 APGs under the new rating criteria. Prior to rating these measures, the FY 2011 Performance Plan was updated to reflect changes due to both Congressional budget action and to correct inaccuracies found in several measures, which were not found prior to the measures' provision in the FY 2012 budget submission to the Congress (available at http://www.nasa.gov/news/budget/index.html). For more details on the changes to NASA's FY 2011 Performance Plan, see Changes to the FY 2011 Performance Plan in the Detailed Performance section (see page 43).

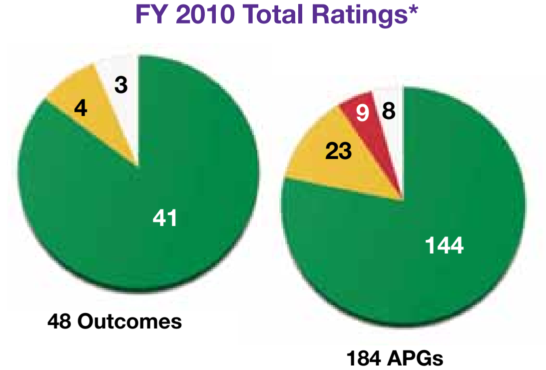
The summary of NASA's rated measures by strategic goal is provided below.

FY 2011 Performance Goal Ratings* by Strategic Goal

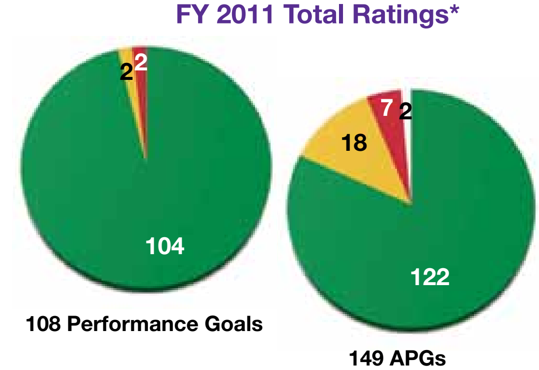


FY 2011 APG Ratings* by Strategic Goal

FY 2010 Total Ratings*



FY 2011 Total Ratings*



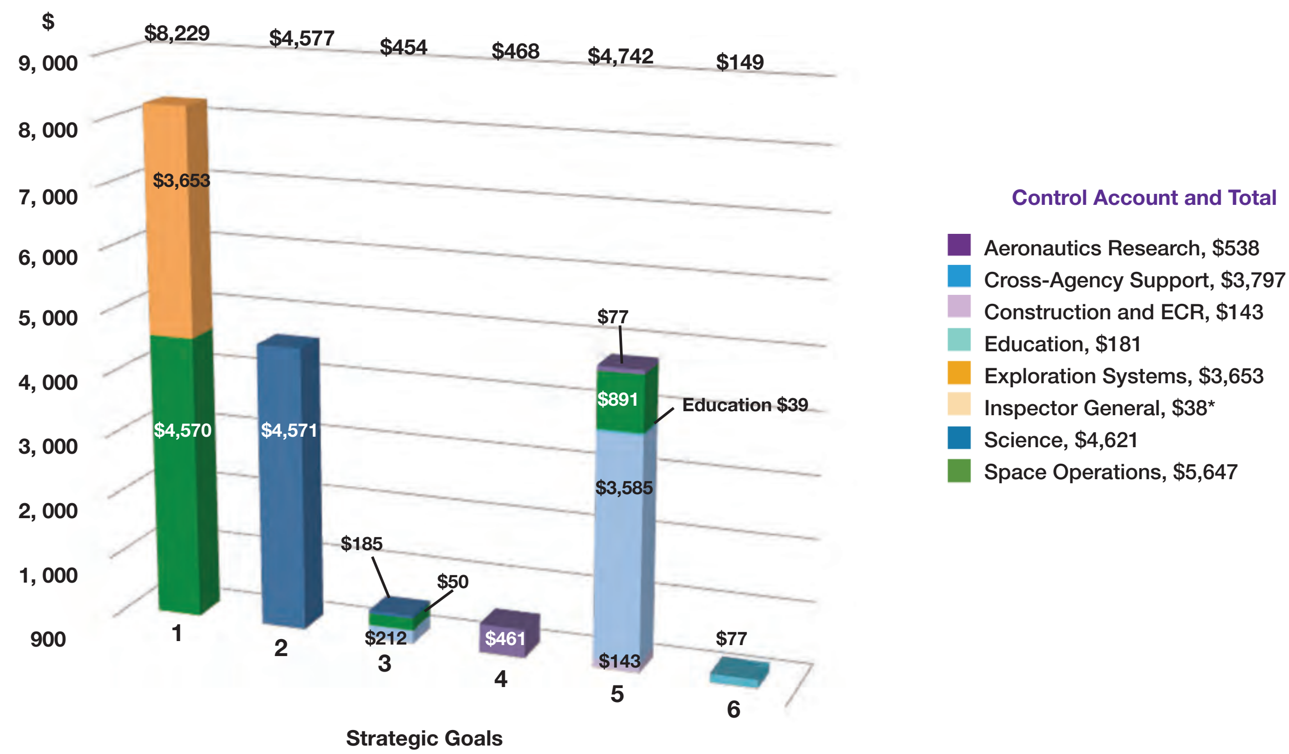
*Numbers denote number of performance measures rated each color.

FY 2011 Cost Toward Strategic Goals

To measure costs incurred toward strategic goals, NASA maps the net costs (per the Statement of Net Cost) to the strategic goals. First, NASA's maps mission directorate, mission support, and Education control accounts, and their supporting programs to the strategic goal to which they contribute. This performance-to-budget alignment is indicated in the Agency's annual performance plan that links each annual performance goal, and responsible program, to the strategic goals. The net costs for each mission directorate or mission support directorate-level control account are then allocated to a strategic goal by the budget-weighted percentage of its programs' contribution to that goal. NASA bases the budget-weighted percentage on the relationship between the programs and control accounts in the fiscal year's final operating plan (this year issued in August) to determine the programs' proportion of budget within the control account.

FY 2011 is the first year where mission support and education activities map directly to a strategic goal. In previous years, the net costs of mission support and education activities were allocated across all strategic goals. The net costs for the Office of Inspector General remain allocated across all strategic goals by an equal amount.

Cost Toward Strategic Goals, Total $18,618
(Dollars in Millions)



*$6 million for Inspector General is allocated to each strategic goal.

Performance Highlights

Strategic Goal 1: Extend and sustain human activities across the solar system.

Humanity's interest in the heavens has been universal and enduring. NASA has had the privilege of extending the Nation's reach beyond the confines of Earth for more than 50 years through robotic and human space exploration.

This fiscal year, NASA took steps to combine the Exploration Systems Mission Directorate and the Space Operations Mission Directorate to form a single organization, the Human Exploration and Operations (HEO) Mission Directorate, which focuses on all aspects of space flight. The new organization will manage a portfolio which includes developing space exploration vehicles and support technologies, obtaining expendable launch vehicles from commercial vendors, managing operation and servicing of the International Space Station (ISS), managing ground operations, and other vital services.

Making the ISS a world-class research facility

FY 2011 was a big year for the ISS. The last flights of the Space Shuttle also marked the final delivery of the large sections that form the living spaces, research laboratories, docking modules, robotic arms, and trusses holding the solar panels.

Discovery (STS-133) delivered the Italian-built Permanent Multipurpose Module (PMM), named Leonardo, that NASA used to ferry supplies, equipment, experiments and other cargo to and from the International Space Station via the Space Shuttle's payload bay. Now it provides more space and accommodations for research. The ISS also received two more Express Logistics Carriers, unpressurized platforms attached to the exterior of the ISS that can be used for research and storage of large replacement parts and systems.

Robonaut 2 is pictured in the ISS Destiny laboratory on August 22 shortly after it was powered up and teams on the ground sent power to the robot for the first time in space. The red flags tied around its wrists are to remind the crew not to use its arms as handles. About a week later, NASA astronaut Mike Fossum, Expedition 28 flight engineer, works with Robonaut 2. (Credit, both images: NASA)

Having completed assembly, ISS mission priorities have shifted from facility assembly to utilization and research. NASA took the first steps in transitioning management of the ISS National Laboratory to an independent non-profit organization by requesting proposals for management of the National Laboratory in February 2011. In August, NASA selected the Center for the Advancement of Science in Space (CASIS), and began transitioning responsibilities. CASIS will help ensure the ISS' unique capabilities are available to the broadest possible cross-section of the U.S. scientific, technological, and industrial communities and will manage research conducted through the National Laboratory.

While the National Laboratory is in transition, the ISS is already being used to develop technologies that will support future objectives in human space exploration. NASA demonstrated advanced robotics technologies and capabilities in February 2011 when ISS crewmembers used the Special Purpose Dexterous Manipulator (SPDM), also known as the Canadarm2 robotic arm, to extract two large external payloads from Japan's H-11 Transfer Vehicle (HTV). In August, ground controllers used the SPDM to change out a piece of failed external hardware without crew participation. Usually, these types of hardware change-outs are performed by a crew member during an spacewalk, requiring up to 26 crew hours to prepare and perform, outside of the safe confines of the ISS. NASA also is using ISS as a platform to demonstrate key robotics technologies needed to meet future human space exploration objectives. Robonaut 2, the first humanoid robot in space, launched in February 2011 aboard STS-133. Co-developed with General Motors (GM), Robonaut's primary job on the ISS is to demonstrate how a dexterous robot can manipulate mechanisms in a microgravity environment, operate safely in the space environment for extended periods of time, assist with ISS tasks, and eventually interact with astronauts. GM plans to use the results in future advanced vehicle safety systems and manufacturing plant applications.

Atlantis (STS-135) delivered the Robotics Refueling Mission (RRM) payload in July and crew members attached it to the outside of ISS. A joint effort between NASA and the Canadian Space Agency (CSA), RRM is designed to demonstrate and test the tools, technologies, and techniques needed to robotically refuel satellites in space—even satellites that were not designed to be serviced in orbit. Payload operations for RRM are planned to begin in FY 2012. Another significant enhancement to the ISS research program in FY 2011 included the delivery of the Alpha Magnetic Spectrometer (AMS), which was delivered in May on *Endeavour* (STS-134). The AMS is a state-of-the-art particle physics detector developed by an international team of 56 institutions from 16 countries. At 15,000 pounds, AMS is the largest scientific payload on the ISS. The AMS experiment will use a large permanent magnet to search for antimatter, dark matter, and dark energy to advance knowledge of the universe and lead to a better understanding of the universe's origin. More information on the many ISS experiments conducted during each Expedition can be found at http://www.nasa.gov/mission_pages/station/main/index.html.

NASA announces new homes for Shuttles

On July 21, 2011, STS-135 touched down at Kennedy Space Center in Florida, ending the last Space Shuttle flight. But it did not mark the end of the Space Shuttle fleet's place in history. On April 12, NASA Administrator Charles Bolden announced the facilities where the four Space Shuttle orbiters will be on permanent display.

Enterprise, the first orbiter built, will move from the Smithsonian's National Air and Space Museum Steven F. Udvar-Hazy Center in Virginia to the Intrepid Sea, Air and Space Museum in New York. While *Enterprise* never flew into space; NASA used it for approach and landing tests in 1977. The Udvar-Hazy Center will become the new home for *Discovery*, which retired after completing its 39th mission in March 2011. *Endeavour*, which ended its last flight on June 1, will go to the California Science Center in Los Angeles. Finally, the Shuttle that flew STS-135, *Atlantis*, will take its place of pride at the Kennedy Space Center Visitor Complex in Florida. (Read about other awarded artifacts.)

At the Kennedy Space Center, Space Shuttle Program crews are prepping the orbiters for transfer to their new homes. Prior to their relocation, technicians and engineers are delving deep into the spaceframe, areas that have not been seen in a while because it would have been too invasive. The teams are pulling out components, conducting inspections, and creating a detailed encyclopedia to pass on to future spacecraft designers. Then the crews will put the components back in place. They will remove the Shuttles' engines and replace them with dummy engine nozzles, keeping the real hardware for further study. They also will remove parts that contain harmful elements. After completing these changes, NASA will deliver the Shuttles looking just as they did the last time they flew.

Next step in space exploration

This fiscal year, NASA announced the design of the key elements that will provide initial capability for crewed exploration beyond Earth.

In May 2011, NASA announced that the Multi-Purpose Crew Vehicle (MPCV) will be based on designs originally planned for the Orion Crew Exploration Vehicle. The spacecraft will have a pressurized volume of 690 cubic feet, with 316 cubic feet of habitable space and eventually will provide the habitable volume for missions beyond low Earth orbit.

As the fiscal year drew to a close, NASA looked toward the future with the announcement of its design for a heavy-lift rocket. Called the Space Launch System (SLS), the rocket will be America's most powerful launch vehicle since the Saturn V that carried Apollo astronauts to the Moon. This heavy-lift rocket will be capable of launching humans to new destinations beyond Earth orbit, including to asteroids and Mars.

The decision to build the SLS is the culmination of a months-long, comprehensive review of potential designs to ensure that the Nation gets the best possible rocket for the investment—one that is powerful and evolvable, so that NASA can adapt it to different missions as opportunities arise and new technologies are developed.

MPCV sits in Lockheed Martin's Vertical Testing Facility where it is being assembled and tested. (Credit: Lockheed Martin)

Strategic Goal 2: Expand scientific understanding of the Earth and the universe in which we live.

NASA's work toward achieving Strategic Goal 2 covers the solar system, from the Sun to the outermost edge of the heliosphere, where the Sun's influence ends, and beyond to the distant reaches of the universe. It includes applications that are part of daily lives, like weather reports and natural hazards monitoring, and science that answers big, fundamental questions: How did life on Earth begin? Is there life elsewhere? How and why are Earth's climate and environment changing? How did stars, planets, and galaxies form and evolve?

The Science Mission Directorate conducts this work through four science themes: Earth Science, Heliophysics, Planetary Science, and Astrophysics. Below are FY 2011 highlights from these themes.

Research shows how massive glaciers move

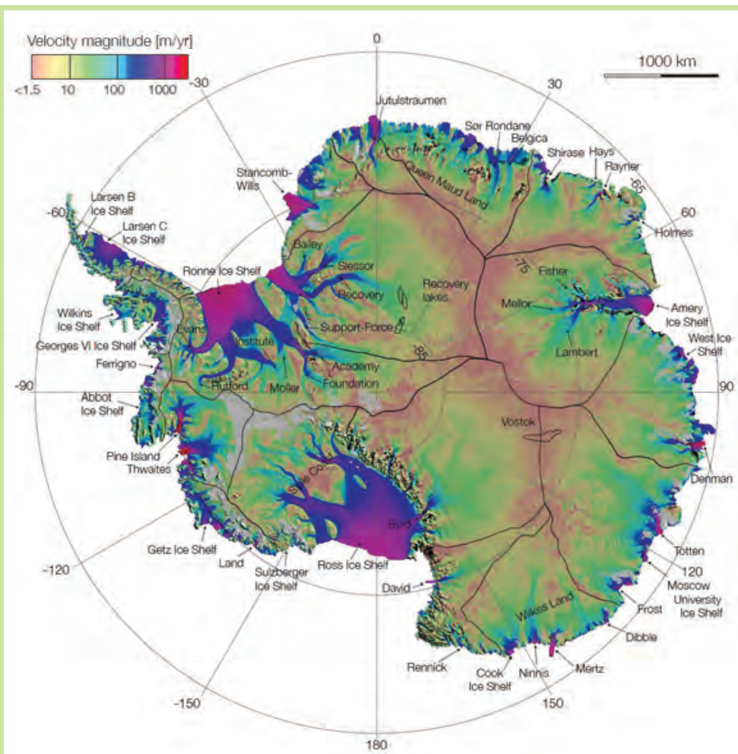
Scientists have not had a clear picture of Antarctic ice-sheet motion at the continental scale—until now. NASA-funded scientists have assembled a comprehensive, high-resolution, digital mosaic of ice motion in Antarctica that confirms some well-know behavior, but also reveals a wealth of new information.

The vast extent of East Antarctica, representing about 77 percent of the continent, has been devoid of quality data. Only a few floating ice shelves have been mapped, and comprehensive velocity mapping has been limited to the lower reaches of key outlet glaciers. This lack of broad-scale detailed observations of ice motion has limited scientists' ability to create numerical models of ice-sheet evolution. These types of models help scientists predict ice loss, sea level changes, climate and weather changes, and other related effects.

This recent, comprehensive survey of Antarctica was obtained using 900 satellite tracks and more than 3,000 orbits of radar data collected during the International Polar Year, dedicated to scientific research of the Arctic and Antarctica. The data came from a variety of orbiting interferometric synthetic aperture radar (InSAR) instruments, including RADARSAT-2 (Canada), Envisat Advanced Synthetic Aperture Radar, or ASAR (Europe), Advanced Land Observing Satellite (ALOS) Phased Array type L-band Synthetic Aperture Radar, or PALSAR (Japan) and the European Remote Sensing (ERS) 1/2 satellite (Europe). Each instrument contributed unique coverage and performance.

The data showed that ice velocity ranges from about an inch a year near ice divides to a couple of miles a year on fast-moving glaciers and floating ice shelves. The distribution of velocities has one peak at 13 to 16 feet a year for the slow-moving ice in East Antarctica and another peak at 812 feet (250 meters) a year for fast-flowing glaciers and ice shelves. The scientists found the highest velocities at the Pine Island and Thwaites glaciers of West Antarctica, with rates several times those of any other glacier. This sector of the ice sheet is undergoing the most rapid change at present, over the widest area, and with the greatest impact on the total ice-sheet mass balance.

The mosaic also provides insight into preferred channels of ice transport. It reveals that every major glacier is the merger of several tributaries that extend hundreds of miles inland. The scientists note that in the Antarctic peninsula, the velocities of the tributaries of Wilkins Ice Shelf and

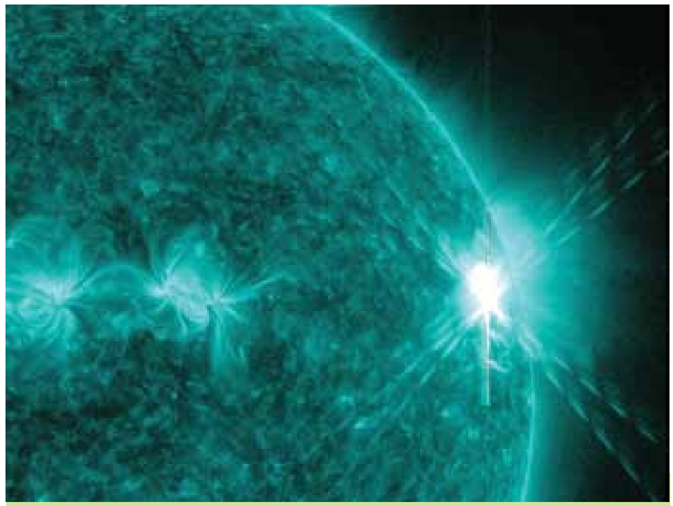


The color-coded map, done on a logarithmic scale and overlaid on a MODIS mosaic of Antarctica, shows the areas of highest ice sheet movement velocities in red and blue, with red exceeding 3,250 feet (1,000 meters) a year. The lowest velocities are in orange and yellow. The black lines delineate ice divides and subglacial lakes. The fast-moving Pine Island and Thwaites glaciers are at center left. The Wilkins and Georges VI ice shelves are on the peninsula at upper left. (Credit: NASA/JPL-Caltech/UCI) of the northern sector of George VI Ice Shelf abruptly transition to zero when they mix with the floating ice shelves, where ice-shelf melt is greatly increased by the underlying warm ocean.

The observation that ice flow in Antarctica is driven by a complex set of meandering, size-varying, speed-varying, intertwined tributaries—most likely dominated by basal-slip motion, when the weight of a glacier exerts enough pressure to melt the ice where it touches the ground, forming a lubricant—challenges the traditional view of ice-sheet flow constrained by internal deformation, and disconnected from coastal regions. Since this latter view has usually been adopted as the basis for continental-scale ice-sheet modeling, the new reference map will help to improve reconstructions of past and ongoing changes in Antarctica, as well as predictions of future ice-sheet evolution in a warming climate. A paper, Ice Flow of the Antarctic Ice Sheet, about the reference map and related findings was published by *Science* online August 18, 2011.

Spacecraft watches the Sun wake from a long solar minimum

As 2011 unfolded, NASA's Solar Dynamics Observatory (SDO) monitored as the Sun has "woken" from the deepest solar minimum in nearly a century. On February 15 and again on March 9, SDO detected a pair of "X-class" solar flares—a powerful kind of x-ray flare. The last such eruption before February 2011 occurred in December 2006. Another eruption on March 7 hurled a billion ton cloud of plasma away from the Sun at five million miles per hour. The rapidly expanding cloud was strong enough to deliver enough energy into Earth's auroral zone to send the Northern Lights into the lower latitudes of Wisconsin, Minnesota, and Michigan.



On August 9, 2011, the Sun emitted an X6.9 (an X-class) flare, as observed here by SDO in extreme ultraviolet light. These gigantic bursts of radiation are often associated with solar eruptions known as coronal mass ejections that can cause geomagnetic storms. Effects of these storms can cause disturbances in the uppermost atmospheric layers, which disrupt GPS and communications signals. (Credit: NASA)

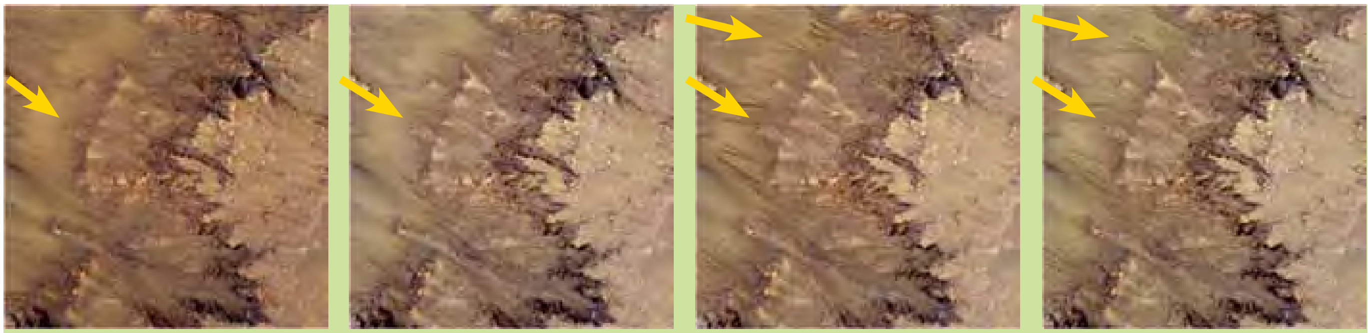
Beginning in 2008, sunspots all but vanished, solar flares subsided, and the Sun was eerily quiet. These solar minima come along every 11 years or so as a natural part of the solar cycle, but this particular solar minimum lasted much longer than usual. SDO provides continual full-disk coverage of the Sun at higher resolution, so researchers are able to closely follow changes in solar activity as part of their effort to better understand the Sun's effect on the space environment. With the return of sunspots will come more solar activity including X-class flares and the return of solar maximum, likely in 2013. (Find out more about X-class solar flares.)

Researchers have identified the consequences of the quiet Sun in every part of the heliophysics regime. These include the highest fluxes of cosmic rays recorded by near-Earth spacecraft and extremely low densities of the upper atmosphere that extends the life of potentially harmful space debris in low-Earth orbit. NASA sponsored a research workshop on the Causes and Consequences of Solar Cycle 24. Many processes driven by solar disturbances were considerably quieted during this solar minimum, providing a rare opportunity to study the heliophysics system in an almost "background" state. Many different systems were affected, but one characteristic that all seem to share is that there is more significant coupling between regions than previously thought.

New evidence suggests water flowing on Mars

Data collected by NASA Mars missions indicate that water probably flowed across ancient Mars, but whether it exists on the surface today is a topic of debate. However, a new sequence of images taken by the Mars Reconnaissance Orbiter (MRO) show linea—narrow, dark streaks on steep slopes—that appear and incrementally grow during warm seasons and fade in cold seasons, indicating that they are formed by liquid water moving down-slope on or near the surface.

The linea extend down from bedrock outcrops, with hundreds of them forming in some rare locations. They appear and lengthen in the late southern spring and summer, when peak surface temperatures range from approximately 250 to 300 kelvin (-10 to 80 degrees Fahrenheit). Liquid brines near the surface might explain this activity, but researchers do not understand the exact mechanism and source of water. This work is important to NASA's objective to understand the processes that determine the history and future of habitability of Mars. (Read more on this story.)



Recurring slope linea do not appear in late winter (first from left). By early spring (second), the slope shows the beginning of the linea, visible as dark parallel lines. Mid-summer (third) shows dramatic, high-contrast linea, which begin to fade in the fall (forth, on the right). (Credit: NASA/JPL-Caltech/Univ. of Arizona)

Firsts beyond the solar system: planet orbiting two suns and a carbon-rich planet

The existence of a world with a double sunset, as portrayed in the film *Star Wars* more than 30 years ago, is now a scientific fact. NASA's Kepler mission has made the first unambiguous detection of a circumbinary planet—a planet orbiting two stars—200 light-years from Earth. Unlike *Star Wars*' Tatooine, the planet is cold, gaseous, about the size of Saturn and not thought to harbor life, but its discovery demonstrates the diversity of planets in the Milky Way galaxy. Kepler detected the planet, officially known as Kepler-16b, by observing transits, where the brightness of a parent star dims from the planet crossing in front of it. The parent stars are smaller than Earth's Sun. One is 69 percent the mass of the Sun and the other only 20 percent. Kepler-16b orbits around both stars every 229 days, similar to Venus' 225-day orbit, but lies outside the system's habitable zone, where liquid water could exist on the surface because the stars are cooler than Earth's Sun. Kepler's mission is to search for Earth-sized planets in or near habitable zones. (Read more about this story.)

NASA's Spitzer Space Telescope observed a huge, searing-hot planet, orbiting a single star, loaded with an unusual amount of carbon. The planet, a gas giant named WASP-12b, is the first carbon-rich world ever observed. Carbon is a common component of planetary systems and a key ingredient of life on Earth. None of the planets in Earth's solar system is known to have more carbon than oxygen, though this ratio is unknown for Jupiter, Saturn, Uranus, and Neptune. Unlike WASP-12b, these planets harbor water—the main oxygen carrier—deep inside their atmospheres, making the oxygen hard to detect and quantify. WASP-12b has excess carbon, some of which is in the form of atmospheric methane. Curiously, the parent star itself has a carbon-to-oxygen ratio that is similar to that of the Sun. How the planet became enriched in carbon relative to its parent star is an unsolved mystery that NASA will investigate as it continues to pursue the objective to generate a census of extrasolar (beyond the solar system) planets and measure their properties. (Read more about this story.)

Strategic Goal 3: Create the innovative new space technologies for our exploration, science, and economic future.

NASA's technology development programs advance mission capabilities and effectiveness, enable scientific discovery, and improve the capabilities of other government agencies and the aerospace industry. NASA's work toward achieving this strategic goal addresses three categories of technology investments that will span the technology readiness level (TRL) spectrum.

The first set of technology investments focuses on fostering early-stage innovation in which a multitude of concept technologies are developed through a process of idea generation, research, innovation, and experimentation.

The second category focuses on taking the best low-TRL technologies (those studied under the first category) and determining which of these potentially "game changing" innovations and technologies are viable through further technology development, prototyping, experimentation, testing, and demonstrations.

The third type of technology investment supports technology development targeting near-term, unique spacecraft or mission needs. Through focused studies, dialogue, and development activities across NASA, as well as with academia and industry, these technology activities will provide improved future technologies that are closely aligned with known requirements.

NASA's new Space Technology Program gets off to a great start

In FY 2011, the Office of the Chief Technologist (OCT) inaugurated its Space Technology Program portfolio, which focuses on developing and demonstrating advanced space systems concepts and technologies to enable NASA's missions. Below are some of the accomplishments from the first year.

In 2008, Congress directed the National Academies to conduct a review of the effectiveness of the NASA Institute for Advanced Concepts (NIAC), which served Agency needs from 1998 to 2007. Based on the National Academies' recommendations and the results of an October 2009 hearing by the U.S. House of Representatives Subcommittee on Space and Aeronautics, NASA re-established NIAC—now called the NASA Innovative Advanced Concepts Program. During the fiscal year, NIAC made its first 30 awards for early investments and partnerships with creative scientists, engineers, and citizen inventors from across the Nation. These investments have the potential to pay huge technological dividends and help maintain America's leadership in the global technology economy. (Read more about the selected 30 proposals.)

NASA conducted the Green Flight Centennial Challenge, created to inspire the development of more fuel-efficient aircraft and spark the start of a new electric airplane industry. The winning teams, which were both electric powered, shattered the fuel efficiency requirement by achieving about twice the required passenger miles per gallon. NASA has awarded the largest prize in aviation history to the first place team, which developed an electric-powered aircraft that flew 200 miles using a little over a half-gallon of fuel equivalent per passenger.

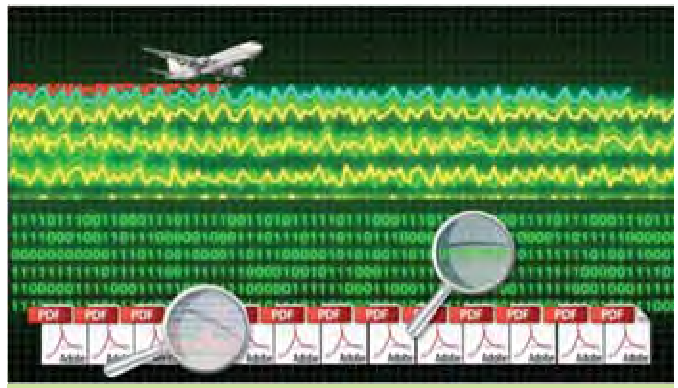
NASA implemented a Space Act Agreement with the Colorado Association for Manufacturing and Technology (CAMT) in December 2010 to promote the commercialization of technology developed for the space program through the creation of a Technology Acceleration Program and Regional Innovation Cluster for Aerospace and Clean Energy. The NASA–CAMT partnership will help companies bridge the gap between prototype design, manufacturing, and commercialization, while identifying commercial applications for NASA technologies. (Read more about this story.)

NASA Deputy Administrator Lori Garver (front right) and Elaine Thorndike, chief executive officer of CAMT sign historic Space Act Agreement at the Colorado State Capitol Building in Denver to promote the commercialization of technology developed for the space program. (Credit: NASA)

In the area of Crosscutting Capability Demonstrations, NASA selected three Technology Demonstration Missions projects to transform space communications, deep space navigation, and in-space propulsion capabilities. These crosscutting flight demonstrations—a space solar sail, a deep space atomic clock, and a space-based optical communications system—have potential to provide tangible, near-term products and to infuse high-impact capabilities into NASA's future space operations missions and other U.S. government and commercial space activities. (Read more about the selections.) NASA made key steps to foster the development of the commercial reusable suborbital transportation industry in August 2011, an important step in the longer-term path that envisions suborbital reusable launch vehicles evolving to provide the Nation with much lower-cost, more frequent, and more reliable access to orbital space. NASA selected seven companies to integrate and fly technology payloads on their commercial suborbital reusable platforms, which will carry payloads near the boundary of space. NASA will draw from this pool of commercial space companies to deliver payload integration and flight services as part of the Flight Opportunities Program. (See the list of chosen providers.) Through this catalog approach, NASA is moving toward the goal of making frequent, low-cost access to near-space available to a wide range of engineers, scientists and technologists. The government's ability to open the suborbital research frontier to a broad community of innovators will enable maturation of the new technologies and capabilities needed to enhance future activities in space.

Strategic Goal 4: Advance aeronautics research for societal benefit.

A key enabler for American commerce and mobility, U.S. commercial aviation is vital to the Nation's economic well-being. NASA's aeronautics research contributes significantly to air travel innovation by exploring early-stage concepts and ideas, developing new technologies and operational procedures through fundamental research, and demonstrating the potential of promising new vehicles, operations, and safety technology in relevant environments. To achieve this strategic goal, NASA focuses on the most appropriate cutting-edge research and technologies to overcome a wide range of aeronautics challenges for America's current and future transportation system.



A NASA data mining algorithm allows analysts to probe an extensive repository containing different data types, including continuous and discrete flight data and text records. Subject matter experts can take a closer look at any anomalous sequences detected by the algorithm to determine if a possible safety issue exists. (Credit: NASA)

NASA supports safer flight operations

Anomalous flights contain data points that are significantly different from other comparable flights. These events, known as anomalies, could be a pilot configuring the airplane for landing (setting flaps and gear) at an inappropriate time, excessive maneuvering close to the ground, or unexpected readings from an airplane system. Anomalies may signify operationally significant events that can have a potential impact on flight safety. However, they are contained within massive data sets and it would be too time consuming for human analysts to find them without support from highly capable algorithms. NASA's Aviation Safety Program is developing data mining algorithms that will detect anomalous flights from within these large datasets, helping analysts identify potential safety issues and conduct targeted studies. Currently when an algorithm detects a statistically significant anomaly, a human subject matter expert reviews the event to determine if it is operationally significant. This step ensures that a potential issue discovered by the algorithm could actually affect flight safety. If an analyst confirms a possible problem, an airline may consider multiple mitigation paths to prevent it from recurring or minimize its safety impact.

This fiscal year, the Aviation Safety Program developed an algorithm that incorporates the novel approach of concurrently considering three different data types: discrete (event-driven), continuous, and text records. The goal is to develop data-driven anomaly detection algorithms that can quickly identify the anomalous flights to narrow the analyst's attention to those relatively few flights that could contain operationally significant anomalies. The algorithm, developed as part of this work, is able to perform this task by using flight-recorded data and, when available, associated text reports. Flight recorders provide discrete variables—typically representing pilot-controlled inputs such as flap position and warnings such as low oil pressure—and continuous variables—usually representing measurements such as altitude, airspeed, and vertical speed. The text reports are provided by pilots, cabin crew, or others associated with the flight, and typically discuss problems that occurred during the flight. The algorithm is scalable, and therefore, can be supplied with a large volume of flight data.

So far, the Aviation Safety Program has tested up to 177,000 flights, using data supplied by industry partner EasyJet. Based on indications provided by the French aerospace research agency, ONERA, and by a retired pilot who provides consultation, they identified three types of operationally significant anomalies present in the flight data. The Aviation Safety Program also found that the new algorithm improved significantly upon a prior algorithm, identifying all anomalies previously identified, as well as several additional operationally significant anomalies, including altitude deviation, flap speed exceedance, and unstable approach. Additionally, the new algorithm's execution time was no more than five percent greater than the execution time of an earlier algorithm, so the inclusion of text records does not lead to a significant execution time penalty.

Going forward, the Aviation Safety Program plans to test the algorithm on even larger datasets. In FY 2012, it will conduct a test on a large 10 terabyte file to determine whether the algorithm can still detect statistically and operationally significant anomalies. This file size is consistent with those available by commercial airlines and through the Federal Aviation Administration-run Aviation Safety Information Analysis and Sharing (ASIAS) System. As an ultimate goal, the program wants analysts to be able to mine the extensive data fields to uncover new areas of potential safety issues that the aviation safety community has not previously considered.

Strategic Goal 5: Enable program and institutional capabilities to conduct NASA's aeronautics and space activities.

Successful missions are enabled by mission support offices, which provide program capabilities and institutional capabilities. NASA's program capabilities, which are focused on meeting multiple complex programmatic objectives, encompass NASA-unique facilities, management of scientific and engineering workforce, and the equipment, tools, and other required resources. The institutional capabilities encompass a broad range of essential technical and non-technical corporate functions for the entire Agency, such as safety and mission assurance, security capabilities, information technologies, and human capital management.

At the newly remodeled Launch Control Center's Young-Crippen Firing Room at NASA's Kennedy Space Center, engineering directorate personnel demonstrate the recently added Space Command and Control System, which will be used for launches of future human spaceflight vehicles. In use since the Apollo era, the Firing Room was rewired and received new equipment and furnishings. (Credit: NASA/J. Grossmann)

Facilities for the future

NASA's physical infrastructure is critical to enable mission success. However, numerous analyses have concluded that NASA facilities are no longer suitable to meet current and future requirements. During 2011, NASA made significant progress in identifying and implementing a strategy that will enable the Agency to evolve toward the most efficient retention, sizing, and distribution of facilities, laboratories, test capabilities, and other infrastructure consistent with NASA's missions and mandates.

Such evolution includes identifying and removing unneeded or duplicative infrastructure. NASA completed Phase I of the NASA Technical Capabilities (NTC) Assessment Task, which put into place a new process and a new database tool that will help NASA balance institutional capabilities with the needs of NASA's future missions. The process and tool enable an integrated assessment of the supply of technical capabilities across all NASA Centers with the demand for technical capabilities across all NASA programs, relating the required resources associated with a capability to program funding and workforce requirements. The value of this new approach was demonstrated at a 2011 Agency-level Technical Capability Forum, where NASA resolved a significant number of supply and demand gaps.

The NTC Assessment Task has laid the groundwork necessary for NASA to arrive at long-term facilities solutions that will preserve and provide the institutional resources needed to support NASA's evolving mission.

NASA buildings are green

Kennedy Space Center rang in 2011 with the grand opening of NASA's "greenest" facility on January 20. As the new hub for fueling spacecraft on journeys to unlock the mysteries of the universe, the Propellants North Administrative and Maintenance Facility will use natural resources to power buildings and vehicles at Kennedy. More than 300 photovoltaic panels on the roof are expected to generate more energy than the facility will need, making it NASA's first net-zero facility. The new facility also will become a test bed for more environmentally friendly projects at NASA Centers by making sure every aspect is truly green.

Part of the parking lot at the Propellants North facility is tailor-made for electric cars. The covered area features plug-in stations for electric vehicles. (Credit: NASA/F. Michaux)

The facility qualifies for the U.S. Green Building Council's (USGBC's) Leadership in Environmental and Energy Design, or LEED, Platinum status, which is the highest of green building certifications. That certification system is based on scores generated by a point system in which the USGBC rates construction. The construction is rated in several environmentally friendly areas, including the use of sustainable sites, materials and resources, water and energy efficiency, indoor environmental quality, and design innovation.

In June, the Langley Research Center was pleased to find out that its new headquarters building also received a "Platinum" status—the highest rating—from the LEED program. It's the first of a planned $330 million program to replace and upgrade center facilities with the future in mind. The building, called Building 2101, had 52 points, just inside the platinum scale.

Strategic Goal 6: Share NASA with the public, educators, and students to provide opportunities to participate in our Mission, foster innovation and contribute to a strong national economy.

NASA's missions are a natural means of interacting with the public and supporting students and teachers. Through the excitement of missions and activities, NASA helps stimulate student interest and achievement in science, technology, engineering, and mathematics (STEM) fields. STEM-focused educators use their skills to motivate student achievement and spur creative and critical thinking both in and out of the classroom. In developing student interest and skills, future workers will be prepared to solve technical challenges that benefit the Nation and improve the quality of life on Earth. Furthermore, an American public that is knowledgeable and interested in science, aeronautics, and exploration will value the impact of advances in these fields that help maintain global competitiveness and a robust economy.

To achieve this strategic goal, NASA Education and the Office of Communications partner with the mission directorates and offices within the Mission Support Directorate, other government agencies, non-profit organizations, academia, and industry.

Education Design Team recommendations set the course for the future of NASA education

After several months of intense effort this fiscal year, the Education Design Team (EDT) completed its mission in January 2011 by issuing its final report. The EDT report contained several recommendations for the development of a new, sustainable, and innovative science, technology, engineering, and mathematics (STEM) education program at NASA. Once implemented, these recommendations will enable NASA to do its part to ensure there are highly educated students in the Nation's STEM pipeline, allowing the United States to compete, prosper, and be secure in the 21st century global community (read report PDF).

Chartered by the NASA Administrator and deputy administrator, the EDT was composed of 12 members chosen from the Office of Education, mission directorates, mission support offices, and Centers based on their depth of knowledge and education expertise. The EDT charter called for an evaluation of the Agency's education programs within the context of current trends in education.

In July, NASA celebrated the 25th anniversary of its longest running internship program, the Langley Aerospace Research Summer Scholars (LARSS) project. As part of the celebration, interns toured facilities at Langley Research Center, including the wind tunnel shown here. LARSS helps to preserve U.S. leadership in aeronautics and space science by producing a well-educated, well-trained, and diverse engineering and science workforce. LARSS has served as a first-of-its-kind model for internship, mentoring, and development programs at other NASA centers and was recently ranked sixth on the list of "10 Best Internships for 2011" by Vault Career Intelligence. (Credit: NASA)

The EDT used a systems design approach, using top-level requirements to analyze all parts of the existing NASA education system to identify opportunities for improvement. By taking into account national education priorities and goals, Administration guidance, Congressional direction, as well as insight from nationally recognized education experts, the EDT critically evaluated NASA's existing education efforts. The resulting outcome was six recommendations intended to improve the impact of NASA's Education Program. The EDT's three programmatic recommendations were:

- Focus the NASA Education Program to improve its impact on areas of greatest national need.
- Identify and strategically manage NASA Education partnerships.
- Participate in national and state STEM education policy discussions.

Their three organizational recommendations were:

- Establish a structure to allow the Office of Education, Centers, and mission directorates to implement a strategically integrated portfolio.
- Expand the charter of the Education Coordinating Committee to enable deliberate education program design and evaluation.
- Improve communication to inspire learners.

Since the acceptance of the EDT recommendations by the NASA associate administrator for Education in February 2011, multiple cross-Agency teams comprised of education stakeholders, including representatives from the Headquarters Office of Education, Center Education offices, and mission directorates, have been aggressively working to develop an implementation plan. The EDT's recommendations have provided a foundation for improving NASA's educational offerings, which will allow the Agency to play a leading role in inspiring student interest in STEM disciplines through its unique workforce, facilities, research and innovations.

Verification and Validation of NASA's Performance Information

Verification and validation processes ensure that performance goals are measurable, with a direct connection to an Agency's mission, and that performance data is accurate, complete, consistent, and current. NASA has verified and validated that the Agency's mission directorates and mission support offices have procedures in place for collecting, maintaining, and processing accurate performance data and can assure Congress and the public that reported performance information is credible.

Each mission directorate, including each office within the Mission Support Directorate and the Office of Education, has a process in place for assessing performance and assigning ratings to their performance goals and annual performance goals. Program officials submit to NASA management the supporting performance information that justifies each rating in accordance with NASA's internal quarterly performance reporting process. NASA conducts additional reviews and evaluations of reported performance data to assess whether the information submitted is consistent with information reported at other internal reviews, or assessments by external independent entities, and complete enough to portray an accurate picture of NASA's performance. This annual performance reporting and verification process culminates in this report.

Financial
Results

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

NASA's financial statements and accompanying notes are presented in their entirety in the Financials section (see page 191). NASA prepares the Consolidated Balance Sheet, Consolidated Statement of Net Cost, Consolidated Statement of Changes in Net Position and Combined Statement of Budgetary Resources, which provide the financial results of operations. This overview focuses on the key information provided in the statements, which describes NASA's stewardship of the resources provided to it by Congress to carry out its mission.

Financial Highlights

Results of Operations

NASA's net cost of operations for FY 2011 was $18.6 billion, a decrease of $2.7 billion, or thirteen percent compared to FY 2010. This decrease primarily represents reduced activity in FY 2011 for the International Space Station (ISS) and Space Shuttle Program (SSP). Most of NASA's Research and Development and Other Initiatives (R&D/Other) emphasized programs are essential to achieving various strategic goals.

NASA's programs and activities are carried out through four R&D/Other initiatives: Aeronautics Research, Exploration Systems, Science, and Space Operations. The Consolidated Statement of Net Cost presents NASA's net costs by R&D/Other initiatives, which is summarized in the table below. The net cost of operations is the gross cost incurred by NASA, less any earned revenue for work performed for other government organizations and the public.

Science and Space Operations initiatives had the largest net costs in FY 2011 at $6.0 billion and $7.2 billion, respectively. The accompanying table provides net cost comparisons for FY 2011 and FY 2010 across the four major initiatives.

Cost by Research and Development and Other Initiatives
(In Millions of Dollars)

R&D/ Other Initiatives		Audited 2011	Audited 2010	% Change
Aeronautics Research				
	Gross Costs	$ 808	$ 816	-1%
	Less: Earned Revenue	119	119	0%
	Net Costs	689	697	-1%
Exploration Systems				
	Gross Costs	4,791	5,360	-11%
	Less: Earned Revenue	68	62	10%
	Net Costs	4,723	5,298	-11%
Science				
	Gross Costs	7,030	6,697	5%
	Less: Earned Revenue	1,019	649	57%
	Net Costs	6,011	6,048	-1%
Space Operations				
	Gross Costs	7,253	9,694	-25%
	Less: Earned Revenue	58	429	-86%
	Net Costs	7,195	9,265	-22%
Net Cost of Operations				
	Gross Costs	19,882	22,567	-12%
	Less: Earned Revenue	1,264	1,259	0%
	Net Costs	$ **18,618**	$ **21,308**	-13%

A significant portion of the decrease in net costs relates to general costs for goods and services used in operations across NASA programs, with the majority for the ISS. Remaining costs are allocated to R&D/Other initiatives.

Aeronautics Research net cost decreased one percent in FY 2011. The Fundamental Aeronautics and Aviation Safety programs decreased. These costs were primarily offset by the Integrated Systems Research Program costs that increased. The Integrated Vehicle Health Management project was realigned with the Aviations Safety program to improve programmatic content.

Exploration Systems net cost decreased eleven percent from FY 2010 to FY 2011 primarily due to a decrease in costs related to the Constellation Systems Program. This decrease was somewhat offset by an increase in costing by the commercial crew and cargo development programs, which is consistent with the transition to the new human space flight directions, and the start-up phase of the new programs.

Science net cost decreased one percent in from FY 2010 to FY 2011. This change primarily reflects increased revenue in the Earth Science Geostationary Operational Environmental Satellite project and reimbursable authority for the Joint Polar Satellite System. These increases in net cost were partially offset by a decrease in the Polar Operational Environmental Satellite (POES) project.

Space Operations net cost decreased twenty-two percent from FY 2010 to FY 2011. This is primarily due to the completion of the operational phase of the Space Shuttle Program (SSP), the transition and retirement of the program elements, and the assembly of the U.S. portions of the International Space Station (ISS), consistent with the transition to the new human space flight directions.

Sources of Funding

NASA receives funds to support its operations primarily through Congressional appropriations. NASA's budgetary resources for FY 2011 totaled $21.3 billion, of which $615 million is the unobligated balance brought forward from FY 2010. NASA's source and use of budgetary authority is summarized in the table below.

NASA Budgetary Resources
(In Millions of Dollars)

Line Item	Audited 2011		Audited 2010		% Change
New Budget Authority	$	18,449	$	18,725	-1%
American Recovery and Reinvestment Act		—		4	-100%
Unobligated Balance Brought Forward		615		1,320	-53%
Other Resources		2,252		1,460	54%
Total Budgetary Resources	**$**	**21,316**	**$**	**21,509**	**-1%**
Total Obligations Incurred		20,639		20,894	-1%
Total Unobligated	**$**	**677**	**$**	**615**	**10%**

New Budget Authority which represents eighty-seven percent of NASA's total budgetary resources for FY 2011, was provided by Congress primarily through two-year appropriations. The Agency's funding appropriations decreased by $276 million, which included a rescission of $37 million.

Other Resources include realized reimbursable income for sharing NASA technology and providing services to other Federal agencies and public entities, and recoveries of budgetary resources that were obligated in a previous year. Other Resources increased by fifty-four percent in FY 2011 primarily for work performed for certain satellites, Geostationary Operations Environmental Satellite, and Polar Operations Environmental Satellite projects.

Obligations Incurred represents NASA's use of $20.6 billion of available budgetary resources to accomplish the Agency's goals within its four R&D/Other initiatives. Obligations Incurred decreased by one percent between FY 2011 and FY 2010. The reduction in obligations for appropriated funds was due to a decrease in the Agency's appropriations in FY 2011.

Balance Sheet

Assets

Total assets as of September 30, 2011 were $19.3 billion, an increase of $1 billion compared to September 30, 2010. The major categories of assets are detailed in the table below.

NASA Assets
(In Millions of Dollars)

Line Item	Audited 2011		Audited 2010		% Change
Property, Plant & Equipment	$	9,840	$	9,635	2%
Fund Balance with Treasury		9,395		8,601	9%
Other		107		92	16%
Total Assets	**$**	**19,342**	**$**	**18,328**	**6%**

NASA's largest category of assets is **Property, Plant and Equipment (PP&E)**, which increased two percent or $205 million in FY 2011. This increase is due to an increase in activity for certain satellites with the Air Force programs.

Fund Balance with Treasury (FBWT) represents NASA's cash balance at the Department of Treasury. FBWT increased by nine percent or $794 million.

Other includes investments of $17 million and Accounts Receivables of $90 million in FY 2011. Accounts Receivable increased by $19 million and primarily relating to billings due for certain satellites with the Air Force programs to replenish the aging fleet of communications spacecraft in the space network.

Liabilities

Total liabilities as of September 30, 2011 were $4.6 billion, an increase of $336 million compared to September 30, 2010. The major categories of liabilities are detailed in the table below.

NASA Liabilities

(In Millions of Dollars)

Line Item	Audited 2011	Audited 2010	% Change
Accounts Payable	$ 1,530	$ 1,462	5%
Other Liabilities	1,623	1,755	-8%
Environmental and Disposal Liabilities	1,445	1,041	39%
Federal Employee and Veteran's Benefits	51	55	-7%
Total Liabilities	**$ 4,649**	**$ 4,313**	**8%**

Accounts Payable, which represents amounts owed to other entities for goods and services received, increased by $68 million in FY 2011. This is due to an increase in liabilities for certain satellites and the Mars Science Lab projects.

Other Liabilities represents estimated contractor costs incurred but not yet paid, as well as contingent liabilities for litigation claims, accrued payroll and related costs; which decreased by $132 million. The reduction is due to lower estimated contractor costs for Space Shuttle Program activity in FY 2011 compared to FY 2010. The Space Shuttle was retired in FY 2011. Other liabilities relating to employee payroll were also lower due to less days of payroll accrual in FY 2011 compared to FY 2010.

Environmental and Disposal Liabilities are estimated cleanup costs for actual or anticipated contamination from waste disposal methods, leaks, spills, and other NASA activity that created, or could create, a public health or environmental risk, and cleanup costs associated with the removal, containment, and/or disposal of hazardous wastes or material and/or property. In FY 2011, NASA recorded an additional $404 million dollars of environmental and disposal liabilities to reflect the estimated total cost of environmental cleanup on known hazardous conditions bringing the total to $1,445 million, which includes anticipated cleanup at disposal for Space Shuttle and PP&E. The amount recorded in FY 2010 was $1,041 million. The majority of the increase is due to changes in individual project estimates and additional liabilities from disposal-related cleanup costs for PP&E.

Federal Employee and Veteran Benefits are amounts that the Department of Labor estimates on behalf of NASA for future worker's compensation liabilities for current employees. The estimate for future worker's compensation benefits includes the expected liability for death, disability, medical and miscellaneous costs for approved compensation cases, plus a component of claims incurred but not reported.

Net Position

Net Position is comprised of both Cumulative Re¬sults of Operations (CRO) and Unexpended Appropriations and increased by $678 million as compared to FY 2010.

NASA Net Position
(In Millions of Dollars)

Line Item	Audited 2011		Audited 2010		% Change
Unexpected Appropriations	$	6,528	$	5,706	14%
Cumulative Results of Operations		8,165		8,309	-2%
Total Net Position	**$**	**14,693**	**$**	**14,015**	**5%**

Unexpended Appropriations were higher by fourteen percent or $822 million in FY 2011 due to lower Appropriations Used primarily resulting from limited budget funding under the Continuing Resolution (CR), during FY 2011, which resulted in less disbursements and the delay of procurements.

Cumulative Results of Operations were lower by two percent or $144 million in FY 2011. During FY 2010 NASA adopted a change in accounting principle which reduced the FY 2011 beginning balance of the CRO by $2.0 billion. This decrease was offset by a change in the Net Cost of Operations and Total Financing Sources of $1.9 billion in FY 2011.

Systems, Controls, and Legal Compliance

Management Assurances

Administrator's Statement of Assurance

November 15, 2011

NASA management is responsible for establishing and maintaining effective internal control and financial management systems that meet the objectives of the Federal Managers' Financial Integrity Act (FMFIA), as well as related laws and guidance. NASA is committed to a robust and comprehensive internal control program. We recognize that ensuring the effective, efficient, and responsible use of the resources that have been provided to the Agency is not only good stewardship, but also the right approach to maximizing our progress toward the realization of our goals. Within the Agency, I have made it clear that I am responsible for establishing and maintaining a sound system of internal control. In turn, I have made these responsibilities clear to my program management, mission support offices, and Center management—and they have communicated this responsibility to their subordinates. As a result, managers and employees throughout the Agency are active on a daily basis in identifying or updating key control objectives, assessing risks, implementing controls or other mitigating strategies, conducting reviews, and taking corrective actions as necessary.

NASA conducted its assessment of the effectiveness of internal control over operations and compliance with applicable laws and regulations in accordance with Office of Management and Budget (OMB) Circular A-123, Management's Responsibility for Internal Control. Based on the results of this evaluation, NASA can provide reasonable assurance that its internal controls over the effectiveness and efficiency of operations and compliance with applicable laws and regulations as of September 30, 2011, were operating effectively and no material weaknesses were found in the design or operation of the internal controls. NASA is also in conformance with Section 4 of FMFIA.

In addition, NASA's Office of the Chief Financial Officer (OCFO) performs an annual self-assessment review of the effectiveness of internal controls over financial reporting in compliance with OMB Circular A-123, Appendix A, "Internal Control Over Financial Reporting." During the current year, no material weaknesses were identified in the design and operation of internal controls over financial reporting. Accordingly, NASA makes an "unqualified statement of assurance" that its internal controls over financial reporting as of June 30, 2011, were operating effectively.

In accordance with the requirements of the Federal Financial Management Improvement Act (FFMIA), management is responsible for reporting on its implementation and maintenance of financial management systems that substantially comply with federal financial management systems requirements, applicable federal accounting standards, and the U.S. Government Standard General Ledger at the transaction level. I am pleased to report that NASA's financial management systems are in substantial compliance with the requirements of FFMIA as of September 30, 2011.

NASA will continue its commitment to ensuring a sound system of internal control exists over operations, financial reporting and compliance with laws and regulations.

Charles F. Bolden, Jr.
Administrator