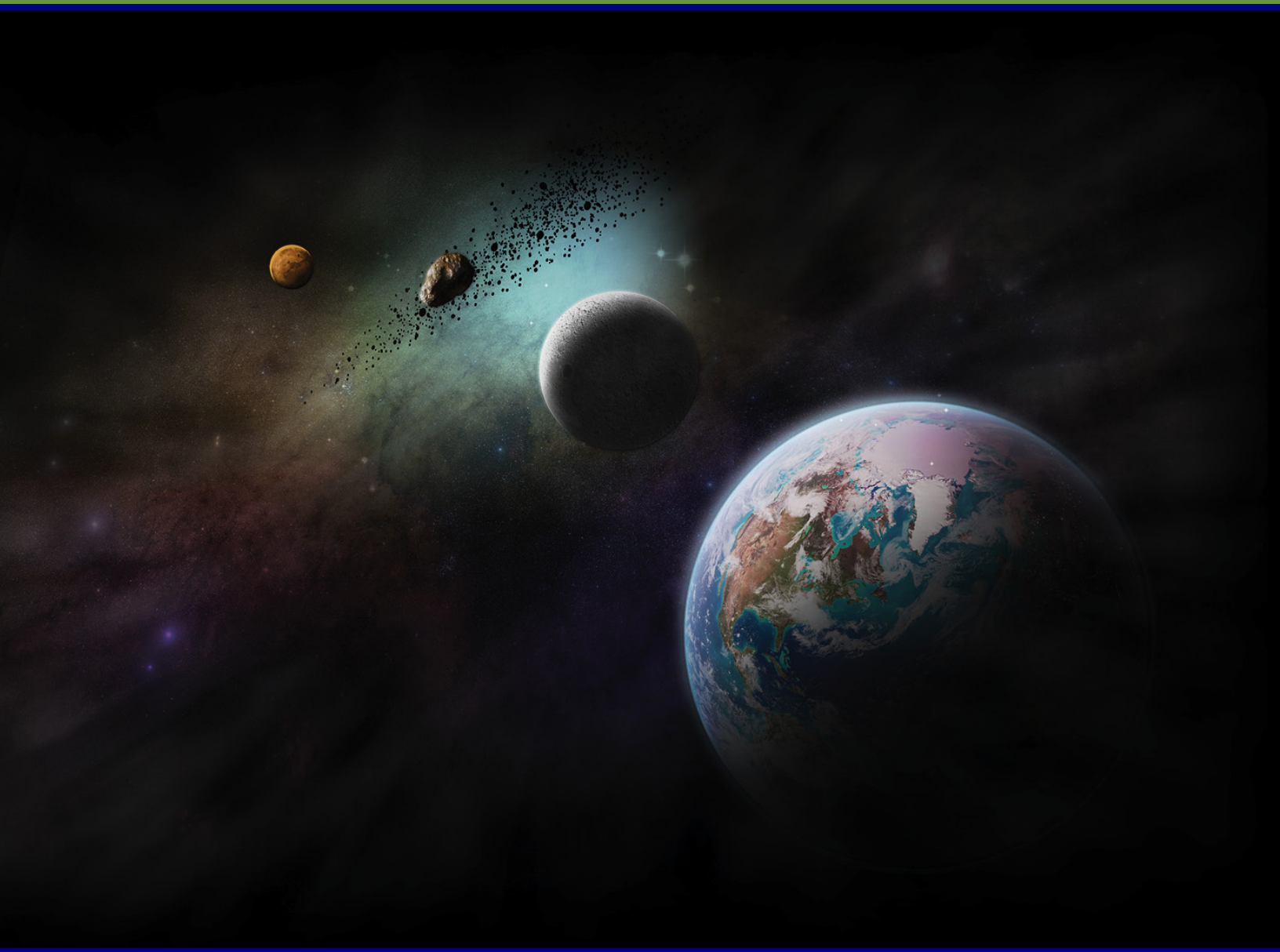
National Aeronautics and Space Administration



FY 2013 Summary of Performance and Financial Information

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Cover Image Captions and Credits

Front Cover:

Outside Front Main Image: Artist concept of planets space. (Credit: NASA)

Outside Front Bottom Images (left to right): Flight Engineer Chris Cassidy exits the Quest airlock for a session of extravehicular activity (EVA) as work continues on the International Space Station. (Credit: NASA); Technicians complete the center section of the backplane and backplane support frame for NASA's James Webb Space Telescope at ATK's facility in Magna, Utah. (Credit: ATK); Artist concept of the Space Launch System and Orion spacecraft being stacked in the Vehicle Assembly Building at NASA's Kennedy Space Center in Florida. (Credit: NASA)

Inside Front: A 2.4 meter Composite Cryogenic Propellant Tank is inspected after undergoing successful pressurized testing (Credit: NASA)

Rear Cover:

Outside Rear: A view of Earth as seen from the Cupola on the Earth-facing side of the International Space Station. (Credit: NASA)

Message from the Administrator

February 17, 2014

I am proud to present the National Aeronautics and Space Administration's (NASA) Fiscal Year (FY) 2013 Summary of Performance and Financial Information summarizing NASA's accomplishments and financial performance for the American people, the President, and the Congress.

At NASA, we believe that there is a direct relationship between fiscal stewardship and mission success. For FY 2013, NASA received an unmodified "clean" audit opinion on our Agency Financial Report. The Mission Performance section of this report provides insight into our program activities. The Financial section details how we use your tax dollars to accomplish our Mission. As Administrator, and in accordance with Office of Management and Budget regulations, I can provide reasonable assurance that the performance and financial information in this report is reliable and complete.

FY 2013 was another banner year for NASA. Our two commercial space transportation partners, SpaceX and Orbital Sciences Corp., successfully launched several critical missions to the International Space Station. These commercial flights mark the beginning of a new era of space transportation for the United States. NASA completed preliminary design of the Space Launch System and continued the development of the Orion Multi-Purpose Crew Vehicle, preparing for exploration beyond Earth orbit. The Mars Exploration Rover, *Curiosity*, continued to dazzle scientists and the public with new data from the surface of Mars and confirmed that conditions once existed there that could have supported life. NASA's ongoing investments in aeronautics research continue to improve aviation safety, efficiency, and noise reduction. Finally, in December 2012, NASA was named the best place to work in the Federal Government among large agencies in a survey conducted by the Partnership for Public Service. I am pleased with this validation of the high commitment and dedication of NASA's talented workforce.

As you can see from this report, NASA is putting your tax dollars to efficient use in maintaining America's leadership in space exploration, bringing critical launch capability back to the United States, creating American jobs, and keeping the Nation on the cutting edge of innovation. If you would like more detail on our financial performance, I invite you to read our Agency Financial Report, which was released in December 2013. To learn more about our progress towards achieving our Strategic Goals, please see the Mission and Performance section of our Congressional Justification, an annually published document available on nasa.gov.

Charles F. Bolden, Jr.
Administrator

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Table of Contents

Image Caption: The United Launch Alliance (ULA) Atlas-V rocket with the Landsat Data Continuity Mission (LDCM) spacecraft onboard is seen on Sunday, Feb. 10, 2013 at Vandenberg Air Force Base, Calif. The Landsat Data Continuity Mission (LDCM) mission is a collaboration between NASA and the U.S. Geological Survey that will continue the Landsat Program's 40-year data record of monitoring the Earth's landscapes from space. (Credit: NASA/Bill Ingalls)

Welcome to NASA

Image Caption: Space Launch Complex 40 on Cape Canaveral Air Force Station in Florida comes alive as the Merlin engines ignite under the Falcon 9 rocket carrying a Dragon capsule to orbit. Liftoff was at 8:35 p.m. EDT on October 7, 2013. Space Exploration Technologies Corp., or SpaceX, built both the rocket and capsule for NASA's first Commercial Resupply Services, or CRS-1, mission to the International Space Station. (Credit: NASA/Rick Wetherington and Tony Gray)

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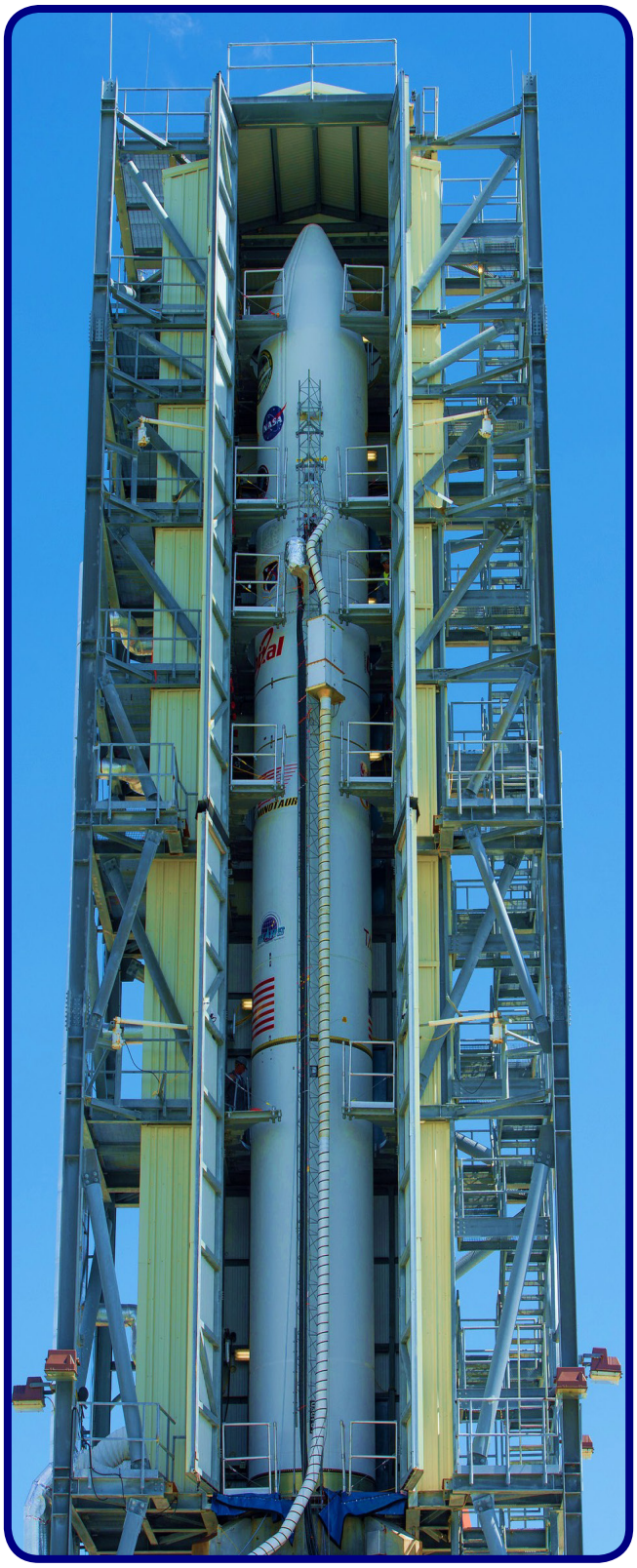
The sun is captured in a "starburst" mode over Earth's horizon by one of the Expedition 36 crew members aboard the International Space Station, as the orbital outpost was above a point in southwestern Minnesota on May 21, 2013. (Credit: NASA)

Introduction

The fiscal year (FY) 2013 Agency Financial Report (AFR) provides an overview of NASA's major programmatic and financial results for FY 2013. It integrates financial and program performance to demonstrate stewardship and accountability. It highlights FY 2013 achievements as well as financial and programmatic challenges and opportunities in the years ahead and strategies for managing them.

NASA demonstrates stewardship and accountability through compliance with the Chief Financial Officers' Act (CFO Act) and the Government Performance and Results Act (GPRA, as amended). Financial aspects of Agency business operations are accounted for according to generally accepted accounting principles and Federal Accounting Standards Advisory Board standards.

NASA presents both performance and results of operations by strategic goal. A high level summary of this budget-results connection is provided in the "statement of net cost" (SNC) found in the Financial Section (page 75). The SNC presents the net cost of operations during FY 2013 by strategic goal and for the



Agency as a whole. In addition, the Financial Section explains significant changes in NASA's financial condition from FY 2012 to FY 2013.

Financial systems that meet requirements of the Federal Financial Management Improvement Act (FFMIA) are vital to NASA's financial management program. The AFR describes NASA's compliance with the FFMIA, as well as the built-in checks and balances required by Office of Management and Budget's (OMB) Circular A-123, which places responsibility for internal controls over financial reporting on Agency management for the purpose of safeguarding assets and improving efficiency and effectiveness of operations.

Finally, the AFR presents the Agency's audited FY 2013 financial statements and the independent auditor's financial audit opinion. The 2013 AFR can be found at http://www.nasa.gov/news/budget/.

Image Caption: The doors of the gantry support structure are opened to reveal the LADEE/Minotaur V Rocket on Pad 0B at the Mid-Atlantic Regional Spaceport (MARS) at NASA's Wallops Flight Facility in Virginia. The Minotaur V launched NASA's Lunar Atmosphere and Dust Environment Explorer (LADEE), a robotic mission that will orbit the moon to provide unprecedented information about the environment around the moon and give scientists a better understanding of other planetary bodies in our solar system and beyond. LADEE launched at 11:27 p.m. Friday, Sept. 6, from NASA's Wallops Flight Facility. (Credit: NASA/Carla Cioffi)

Mission and Vision Statement

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 and Congress unveiled an ambitious new direction for NASA, laying the groundwork for a sustainable program of exploration and innovation. This new direction extends the life of the International Space Station, supports the growing commercial space industry, and addresses important scientific challenges while continuing our commitment to robust human space exploration, science, and aeronautics programs. The strong bipartisan support for the NASA Authorization Act of 2010 confirms our essential role in addressing the Nation's priorities.

In early 2014, NASA plans to release a new Strategic Plan that will outline the strategic direction for the next four years and beyond. It will embody the spirit of the Agency's founding principles, as well as recent policies and legislation. The plan will introduce a new framework of goals and objectives that will allow our Nation to lead humanity into space while improving life on Earth.

The current Strategic Plan, released in 2011, laid out the Vision and Mission for NASA's strategic direction. NASA's Vision and Mission are:

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 following overarching strategies govern the management and conduct of our aeronautics and space programs. These are standard practices that each organization within NASA employs in developing and executing their plans to achieve our strategic goals. They also provide a framework that guides our support for 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 the multitude of challenges faced by our Nation. The overarching strategies, listed below, help strengthen the Agency and support U.S. competitiveness on a global scale.

The NASA Strategic Plan was revised as a result of the GPRA Modernization Act of 2010 (GPRAMA). GPRAMA was enacted to improve the Federal Government's performance management framework to reinforce key elements of the Administration's approach to improving the effectiveness and efficiency of the Government. In response to this revision of the law, NASA developed four Agency Priority Goals for FY 2012 and FY 2013, which were incorporated into the Strategic Plan. These Priority Goals are in addition to the annual performance goals in the FY 2012 and FY 2013 performance plans. Goal statements for each Agency Priority Goal are as follows:

Agency Priority Goals

International Space Station
Sustain operations and full utilization of the International Space Station (ISS)

Human Exploration and Operations
Develop the Nation's next generation Human Space Flight (HSF) system to allow for travel beyond low Earth orbit (LEO).

Mars Science Laboratory
Use the Mars Science Laboratory Curiosity Rover to explore and quantitatively assess a local region on the surface of Mars as a potential habitat for life, past or present.

Space Technology
Enable bold new missions and make new technologies available to Government agencies and U.S. industry.

Organization

NASA's organizational structure is designed to accomplish its mission and provide a framework for sound business operations, management controls, and safety oversight. The Office of the Administrator provides overarching vision and strategic direction. The Agency's science, research, and technology development work is implemented through four Mission Directorates supported by one Mission Support Directorate:

Science Mission Directorate (SMD) manages the Agency's Science portfolio budget account and focuses on programmatic work on Earth, planetary, astrophysics, and heliophysics research. SMD engages the United States' science community, sponsors scientific research, develops and deploys satellites and probes in collaboration with NASA's international partners to answer fundamental scientific questions and expand our understanding of space. Additional information on SMD is available at: http://science.nasa.gov/.

Aeronautics Research Mission Directorate (ARMD) manages the budget account for the Agency's Aeronautics and applied research activities that improves current and future air travel. ARMD works to solve challenges that still exist in our nation's air transportation system, including: air traffic congestion, safety, and environmental impacts. Another significant goal of ARMD programs is to improve our national air transportation system by developing "green aviation" solutions. Additional information on the ARMD is available at: http://www.aeronautics.nasa.gov/.

Space Technology Mission Directorate (STMD), new in FY 2013, manages the Space Technology account which supports crosscutting activities of the Office of the Chief Technologist. STMD manages advanced technology development within NASA and the commercial sector. It develops crosscutting and pioneering new technologies and capabilities needed by the Agency

to achieve its current and future missions. STMD programs complement other technology development activities in NASA's other Mission Directorates, delivering solutions to NASA's needs for new technologies for future missions in science and exploration. Additional information on STMD is available at: http://www.nasa.gov/directorates/spacetech/home/index.html.

Human Exploration and Operations Mission Directorate (HEOMD) manages the budget account for the Exploration and Space Operations portfolio. HEOMD manages development of the Orion Multi-Purpose Crew Vehicle (Orion-MPCV), future exploration technologies, and works with U.S. commercial space industry partners to develop commercial systems for providing crew and cargo transportation services to and from low Earth orbit. HEOMD also manages operations and research for the International Space Station (ISS), and communications systems and networks that enable deep space and near-Earth exploration. Additional information on the HEOMD is available at: http://www.nasa.gov/directorates/heo/home/index.html.

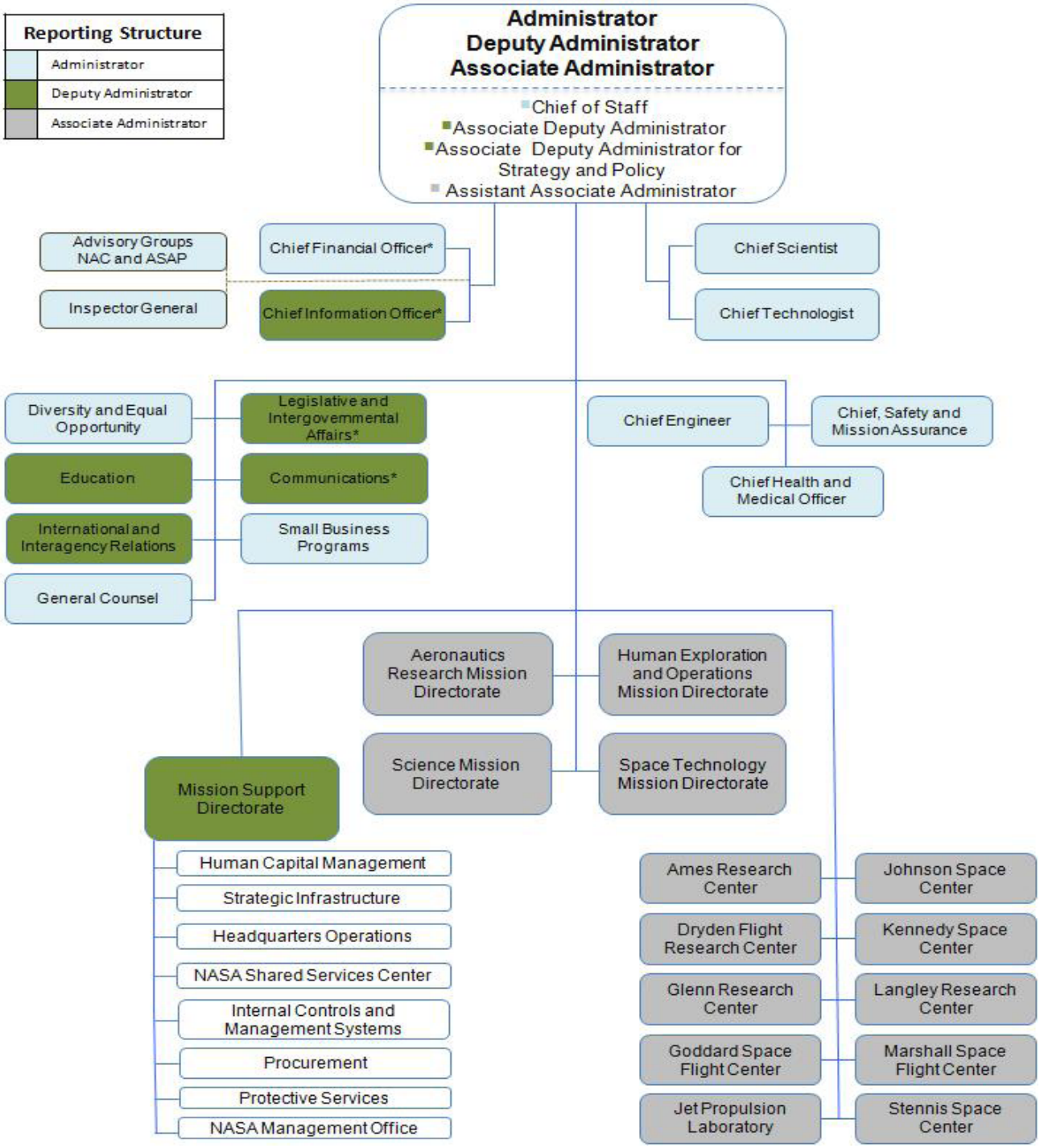
Mission Support Directorate (MSD) supports all NASA Missions in a crosscutting manner. For example, MSD manages the Cross Agency Support (CAS) and Construction and Environmental Compliance and Restoration (CECR) accounts which cut across all Mission Directorates. CAS and CECR accounts fund operations at Headquarters and the Centers as well as institutional and programmatic construction of facilities. MSD progress reports on major national initiatives to the Administrator and other senior Agency officials; provides independent reviews and/or investigations; and liaises with the public and other federal agencies. MSD is based at Headquarters but has representatives at the Centers to provide coordination and control. Additional information on the MSD is available at: http://msd.hq.nasa.gov/.

Office of Education (Education) develops and manages a portfolio of educational programs for students and teachers at all levels. Education seeks to develop a vibrant pool of future workforce for sustainable support of national and NASA mission by attracting and retaining students in STEM disciplines, and raising public awareness of NASA's activities. To achieve these goals, Education works in partnership with other government agencies, non-profit organizations, museums and the education community at large. Additional information on the Office of Education is available at: http://www.nasa.gov/centers/dryden/education/mission.html.

The **Administrator's Staff Offices** support the Administrator's administrative responsibilities by providing 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. Additional information on the Administrator's Staff Offices is available at: http://www.nasa.gov/about/org_index.html.

Administratively, NASA is organized into one Headquarters Office located in Washington, DC, nine operating Centers located across the country, and the Jet Propulsion Laboratory, a federally funded research and development center operated under a contract with the California Institute of Technology. NASA works in partnership with academia, the private sector, state and local governments, other Federal agencies, and a number of international organizations to support and achieve its mission.

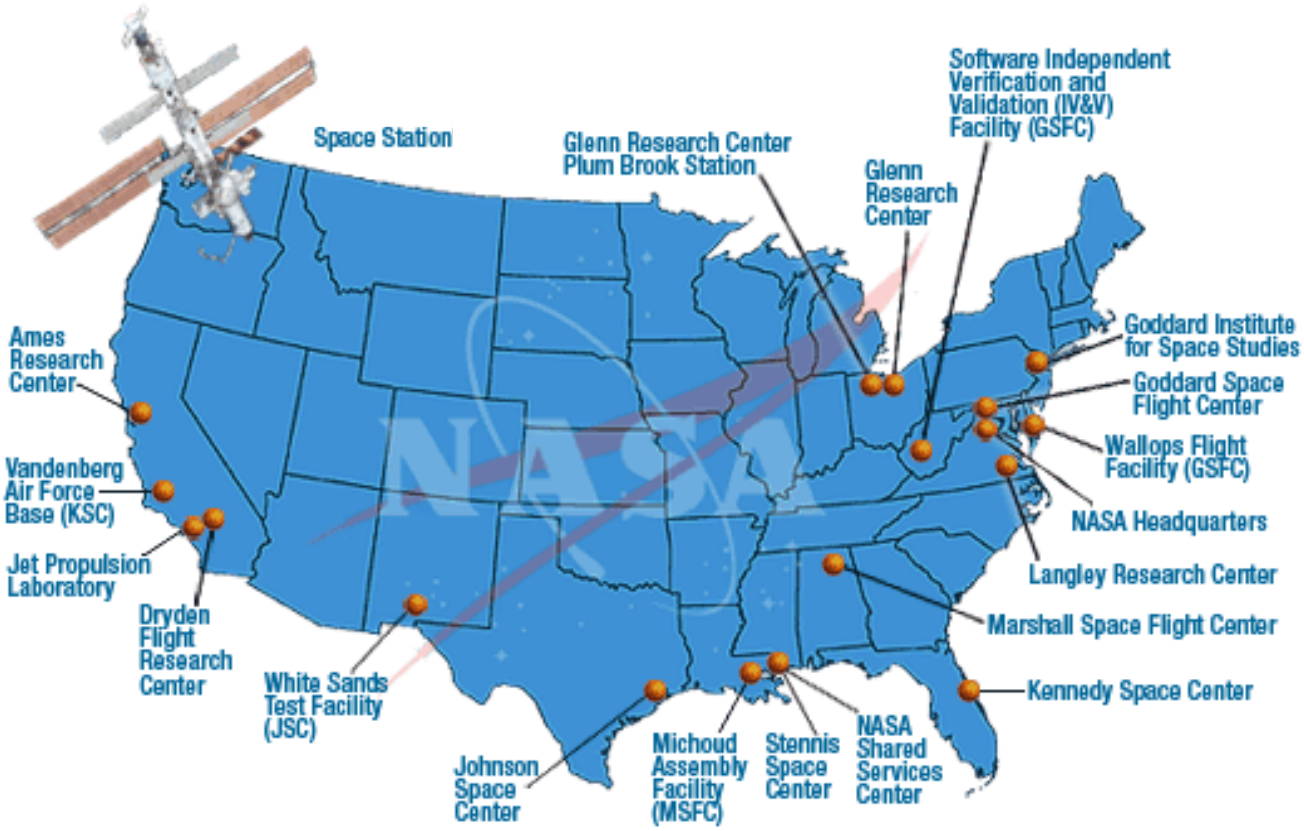
Organizational Structure



Note:
* Center functional office directors report to Agency functional AA. Deputy and below report to Center leadership.

Centers and Facilities Nationwide

Under the leadership of the Administrator, NASA offices at Headquarters provide overall guidance and direction to the Agency. NASA's Centers and installations conduct the Agency's day-to-day work in laboratories, on airfields, in wind tunnels, in control rooms, and in NASA's other one-of-a-kind facilities.



Note: The Jet Propulsion Laboratory (JPL) is a federally funded research and development center in Pasadena, California. The California Institute of Technology manages JPL.

Workforce

As of the end of FY 2013, NASA employed more than 18,000 civil servants, including full-time, part-time, term appointees, student and other non-permanent workers at nine Centers, Headquarters, and the NASA Shared Services Center. In addition, the Jet Propulsion Laboratory, operated by the California Institute of Technology, employs approximately 4,700 people. To see more information about workforce profile and distribution, visit the Workforce Information Cubes for NASA at http://wicn.nssc.nasa.gov/.

NASA's talented and engaged people are our greatest resource. The NASA mission requires great responsibility and the continued need for a highly skilled, agile, inclusive, and innovative workforce. While many drivers of a positive workplace culture contribute to employee engagement and mission accomplishment, analysis showed that three areas have the greatest potential to increase innovation given our current environment. The NASA Strategic Management Council has agreed to focus on these three principal areas that will help to embed innovation in the NASA culture.

- Recognizing and rewarding innovative performance: Reward and appreciate employees for their innovative performance and contributions to their workplace.
- Engaging and connecting the workforce: Engage employees in the NASA mission and enable them to cooperate, collaborate, and network with one another.
- Building model supervisors and leaders: Develop supervisors and leaders who view developing employees as an important and productive use of time.

NASA cares about the environment in which employees work. Direct attention to the NASA work environment, workforce and culture through both inclusion and innovation strategies are critical to achieving NASA' s mission.

Image Caption: NASA Social attendees pose for a group photograph following a NASA Social exploring science on the International Space Station at NASA Headquarters, Wednesday, Feb. 20, 2013 in Washington. NASA's workforce is energizing the public with innovative social methods. (Credit: NASA/Carla Cioffi)

Shared Values, Shared Results

NASA's tradition of excellence is rooted on the four uncompromising shared core values of safety, integrity, teamwork, and excellence, as well as the firm belief that failure is not an option.

Safety: Constant attention to safety is the cornerstone of mission success. NASA is committed, individually and as a corporate 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 exemplifying, 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: The most powerful force behind NASA's mission success is a multi-disciplinary team of diverse, competent people across all NASA Centers and Headquarters. Teamwork at NASA embodies the belief that each team member brings unique experience and important expertise to project issues. This approach to teamwork improves the likelihood of identifying and resolving challenges to safety and mission success. NASA is committed to cultivating and sustaining an environment that fosters this approach to 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.

FY 2013 In Review

Mission Performance

Performance Overview

NASA produced an Agency Financial Report (AFR) released in December 2013 and will post the performance details in the Annual Performance Report (APR) on NASA's website at www.nasa.gov as soon as the FY 2015 budget is released. Congress, the Government Accountability Office (GAO), and the Office of Management and Budget (OMB) have recognized NASA for its culture of performance and data-driven performance management. 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 the American people.

In FY 2013, NASA continued along the course it set with the 2011 Strategic Plan. 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 also marked another step in the evolution of NASA's performance management. The Agency set a new strategic goal to emphasize the importance of supporting the capabilities that enable NASA's missions. The plan also calls out education and outreach as an important means for making data from science missions, research, and other discoveries available for the benefit of the Nation. These strategic additions to NASA's performance framework support more effective and holistic decision-making. Strategic Goals 5 and 6 allow NASA leaders to track organizational, institutional, and outreach performance beyond discreet program, projects, and spaceflight missions. This information makes data-driven decision-making possible across all of NASA's activities, and gives decision-makers the objective performance information they need to prioritize and balance funding between individual mission needs and the requirements of institutional and program capabilities that enable those missions. NASA's 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 aeronautic 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.

Using Agency rating criteria, NASA measures and communicates its progress toward achieving its performance goals (PGs), targets for the next three to five years, and annual performance indicators (APIs) for FY 2013. NASA determines these ratings based on a series of internal assessments that are part of ongoing monitoring of NASA's program and project performance. External entities, such as scientific peer review committees, aeronautics technical evaluation bodies, and the OMB, validate the ratings prior to publication in the Annual Performance Report (APR). This year, NASA will present its APR and final ratings with the FY 2015 Congressional Budget Justification.

Rating	Rating Criteria for Performance Goals
Green (On Track)	NASA achieved or expects to achieve the intent of the performance goal within the estimated timeframe. NASA achieved the majority of key activities supporting this performance goal.
Yellow (At Risk)	NASA expects to achieve the intent of the performance goal within the timeframe; however, there is at least one likely programmatic, cost, or schedule risk to achieving the performance goal.
Red (Not on Track)	NASA does not expect to achieve this performance goal 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.

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

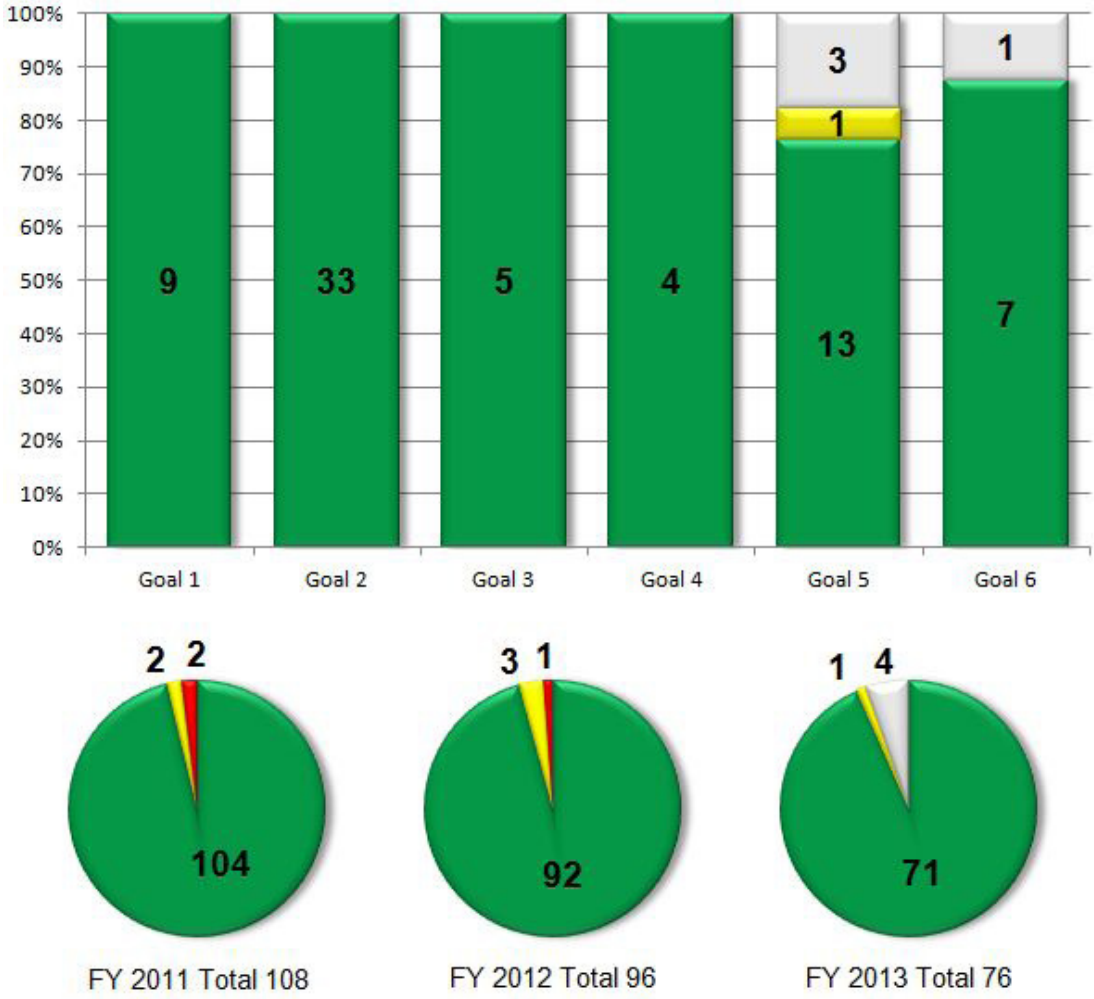
Performance Summary

In FY 2013, NASA reviewed progress toward 76 two to five year performance goals and 94 APIs. Prior to accessing these measures, the FY 2013 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 2014 budget submission to the Congress (available at http://www.nasa.gov/news/budget).

The summary of NASA's preliminary assessment of progress by strategic goal is provided below. The Agency will release final ratings in the APR with the President's FY 2015 Budget.

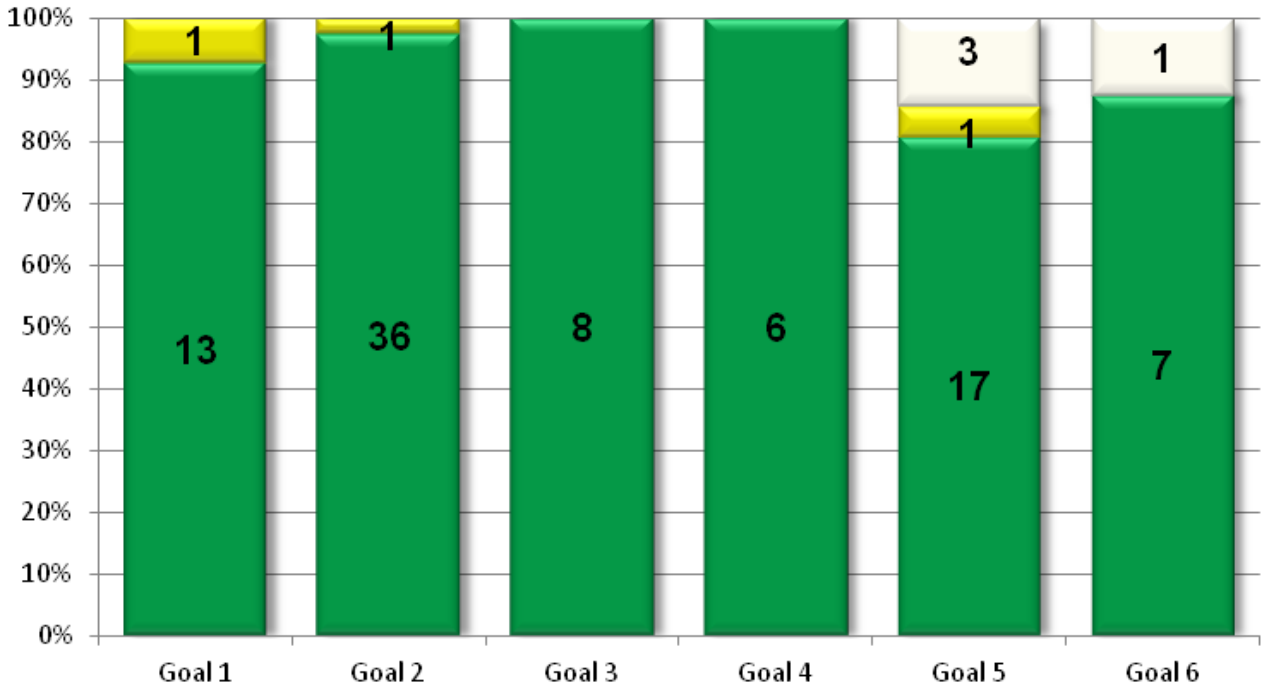
Performance Goals*

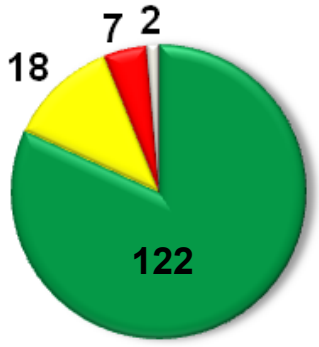
FY 2013 Performance Goal Ratings by Strategic Goal



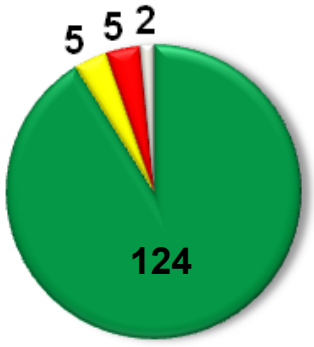
*These ratings are a high level summary of performance and reflect preliminary year-end assessment of progress. For final ratings, specific descriptions of measures, rating explanations, and performance improvement plans, refer to the Annual Performance Report within the Management and Performance Section of NASA's FY 2015 Congressional Justification.

Annual Performance Indicators*
FY 2013 APIs by Strategic Goal

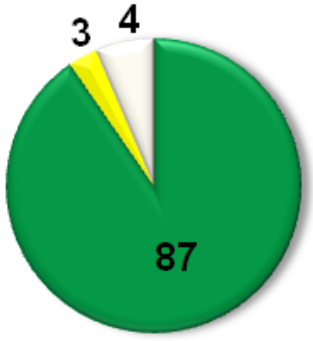




FY 2011 Total 149



FY 2012 Total 136



FY 2013 Total 94

*These ratings are a high level summary of performance and reflect preliminary year-end assessment of progress. For final ratings, specific descriptions of measures, rating explanations, and performance improvement plans, refer to the Annual Performance Report within the Management and Performance Section of NASA's FY 2015 Congressional Justification.

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Strategic Goals and Highlights

Strategic Goal 1:
Extend and sustain human activities across the Solar System.

For over 50 years, NASA has been developing the capabilities that will support the country's long-term human spaceflight and exploration efforts. With the help of domestic and international partners, NASA has embarked on a steady progression of activities and milestones that has prepared the Agency for the more difficult challenges ahead — expanding human presence beyond low Earth orbit. NASA will pursue this goal through strategic investments and partnerships to drive advances in science and technology that continue to contribute to new products and services. To be successful, NASA will need full participation from international partners and the commercial sector.

Exploration Systems Development

NASA's exploration efforts include the Orion spacecraft, Space Launch System (SLS)

Image Caption: On August 15, 2013, at the Naval Station Norfolk near NASA's Langley Research Center in Virginia, NASA and the U.S. Navy conducted a stationary recovery test on the Orion boilerplate test article in the water near a U.S. Navy ship. NASA and the U.S. Navy are conducting tests to prepare for recovery of the Orion crew module and forward bay cover on its return from a deep space mission. The stationary recovery tests allow the teams to demonstrate and evaluate the recovery processes, the hardware and the test personnel in a controlled environment. (Credit: NASA)

heavy-lift launch vehicle, and Exploration Ground Systems (EGS) infrastructure required to conduct crewed missions of exploration into deep space, including a proposed mission to send astronauts to a redirected asteroid inserted into a stable orbit around the Moon.

Orion will carry up to four astronauts to, and support operations at, destinations in our solar system for periods of approximately 21 days. Exploration Flight Test-1 (EFT-1), an un-crewed, atmospheric re-entry test mission of the Orion to test spacecraft systems, is on track for launch in 2014. The EFT-1 test flight will encompass the Orion spacecraft completing two orbits of the Earth and re-entering the atmosphere at a high-speed, characteristic of a returning deep space exploration mission. The test will provide valuable data about the spacecraft's systems, including its heat shield. The flight test article for this mission is already in place at the Kennedy Space Center and being readied for this test.

The heavy-lift SLS will initially be capable of lifting 70-100 metric tons before evolving to a lift capacity of 130 metric tons. The SLS will use a liquid hydrogen/liquid oxygen propulsion system, with a Core Stage utilizing existing Space Shuttle Main Engines for the initial capability. The first two SLS launches will feature five-segment solid rocket boosters (SRBs) based on the Space Shuttle SRBs. For the upper stage, SLS will use an Interim Cryogenic Propulsion Stage for the first two exploration missions. NASA is evaluating the appropriate phasing of advanced boosters and upper stages to achieve the 130-metric-ton capability.

EGS will develop the necessary infrastructure and procedures at the Kennedy Space Center to prepare, assemble, test, launch, and recover the Exploration architecture elements. EGS will focus on the launch complex as an integrated, multi-use capability to enable more efficient and cost-effective ground processing, launch and recovery operations.

ISS Research Capabilities Enhanced Through Technological Advances

This year, the International Space Station (ISS) underwent an extensive communications system modernization that significantly increased the capacity for transmitting research and development data and video to Earth. These technological advances improve the operability of the ISS, and enhance the capacity for research and technology development on ISS to benefit life on Earth and enable long duration human spaceflight beyond low Earth orbit.

Every piece of data from the ISS flows through the fleet of orbiting Tracking and Data Relay Satellites (TDRS) to ground stations on Earth. The new communication system upgrades dramatically improve ISS data, audio, and video capabilities, doubling the ability for the ISS to support scientific research. The number of video and audio channels doubled as well, and the number of experiment data channels that can be downlinked simultaneously increased from 8 to 64, significantly increasing the ability to schedule and conduct research operations on the ISS. The upgraded ISS communications systems provide video and data from experiments on the ISS to researchers on the ground. In addition, the extra audio channels provide more capability for researchers to talk to the onboard crew while they are conducting the experiments in space.

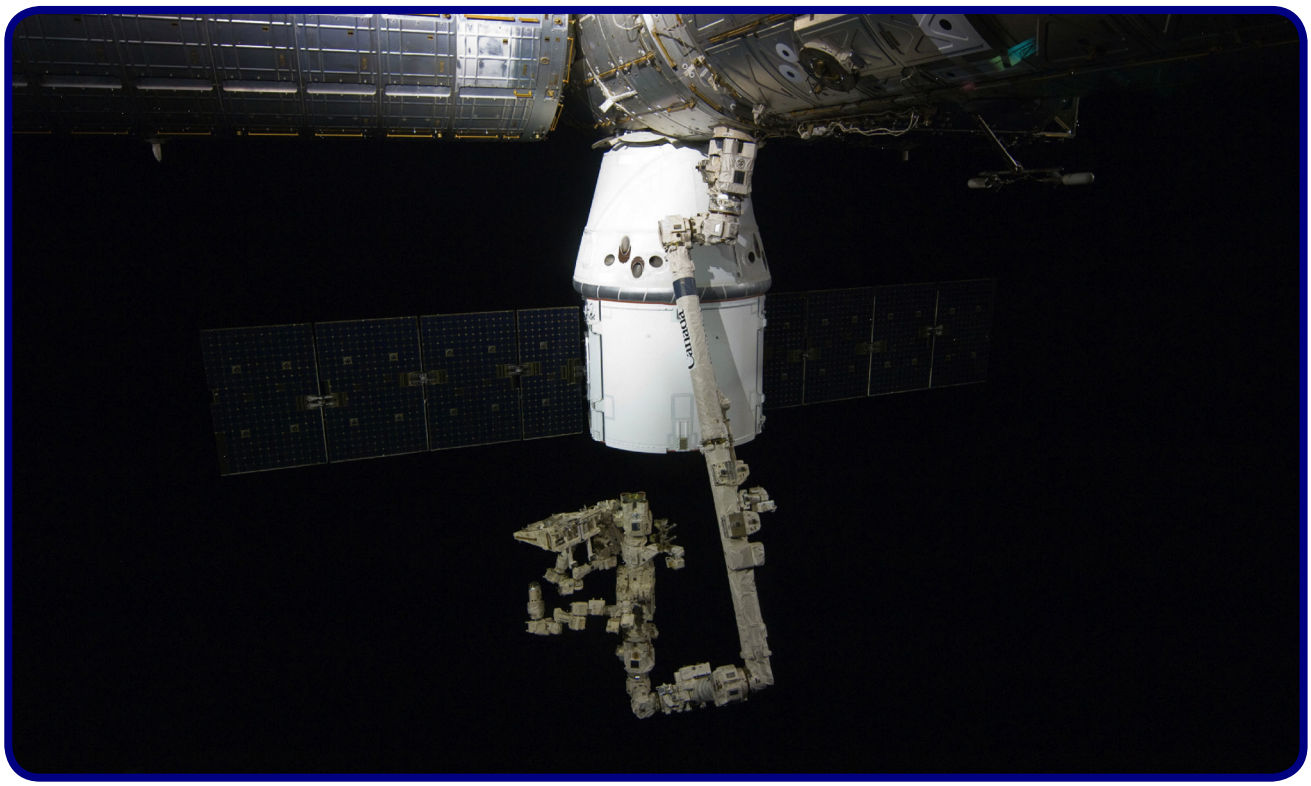

Image Caption: The SpaceX Dragon commercial cargo craft is berthed to the Earth-facing side of the International Space Station's Harmony node. Dragon became the first commercially developed space vehicle to be launched to the station to join Russian, European and Japanese resupply craft that service the complex while restoring a U.S. capability to deliver cargo to the orbital laboratory. (Credit: NASA)

Other Key Achievements in FY 2013

- NASA continues to extend human presence in space by enabling an expanding US commercial space transportation industry. NASA's commercial cargo partners successfully delivered cargo to the ISS. In October and March, the first two contracted SpaceX resupply missions successfully berthed to the ISS, delivering supplies and returning scientific research to Earth. In September, Orbital successfully flew their first COTS demonstration mission to the ISS also delivering crew supplies and research.

- NASA's three commercial crew partners continue to make substantive progress developing and demonstrating the crew transportation capabilities that will ensure NASA can fly crew members to the ISS from US soil. In December, NASA awarded three certification products contracts to conduct activities that will enable commercial crew transportation certification.

- The utilization of the ISS as an observing platform enables the US Department of Energy-sponsored Alpha Magnetic Spectrometer (AMS) to conduct its world-class science research. The AMS launched to the ISS in May 2011, and continues to provide new insights into our Milky Way Galaxy. The initial AMS cosmic-ray particle results, announced in April 2013, indicated the existence of either a previously unknown dark matter

particle or a spinning neutron star (i.e., pulsar) somewhere relatively close to our Solar System. More recent AMS cosmic ray particle results announced in Rio de Janeiro in July provide new insights into the origin and propagation of cosmic ray particles in our Galaxy, and contradict earlier, less precise measurements made by other observatories and satellites.

- NASA and the European Space Agency (ESA) signed a Memorandum of Understanding in January, where ESA will provide a service module for NASA's Exploration Mission-1, currently scheduled for launch in 2017.

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

NASA is expanding the scientific understanding of Earth and the universe by pursuing the answers to profound science questions: How and why are Earth's climate and environment changing? How do planets and life originate? How does the universe work, and what are its origin and destiny? Are we alone? Informed by the priorities set by the Nation's best scientific minds through the National Academies' decadal surveys in Earth science, heliophysics, planetary science, and astronomy and astrophysics, NASA develops missions of scientific exploration. NASA uses space observatories and space probes to view the Earth from space, observe and visit other bodies in the solar system, and gaze out into the galaxy and beyond. NASA analyzes the data gathered by these science missions to enhance humanity's understanding of its place in the universe.

Astrophysics

NASA leads the Nation and the world on a continuing journey to answer some of the most profound questions that touch the hearts of all humanity: How does the Universe work? How did we get here? Are we alone? The scope of astrophysics is truly breathtaking, ranging from the birth of the universe and the development of stars and galaxies over cosmic time, to the search for life on planets around other stars. Often in cooperation with ground-based observatories, NASA astrophysics missions exploit the full range of the electromagnetic spectrum and the physics of high-energy subatomic particles to understand the broad diversity of objects in the universe.

Kepler Dramatically Broadens the Exoplanet Census

NASA's Kepler Space Telescope is the first telescope capable of detecting Earth-sized planets in the habitable zone of Sun-like stars. A star's habitable zone is the region of the star's planetary system where liquid water might exist on the surface of a celestial body. The Earth is in the habitable zone of the Sun. Kepler announced the discovery of over 1,200 new planet candidates, bringing the total to more than 3,500 planet candidates orbiting over 2,600 unique stars. The most difficult exoplanets to find are those that are small and those that are farther from the star, and hence in the habitable zone.

In 2013, Kepler began to discover exoplanets that are almost as small as the Earth and in orbits large enough to put the exoplanets near the habitable zone. Several of the exoplanets discovered in 2013 are smaller than Mercury and at least three of the newly discovered exoplanets are less than twice the size of Earth and orbit in their star's habitable

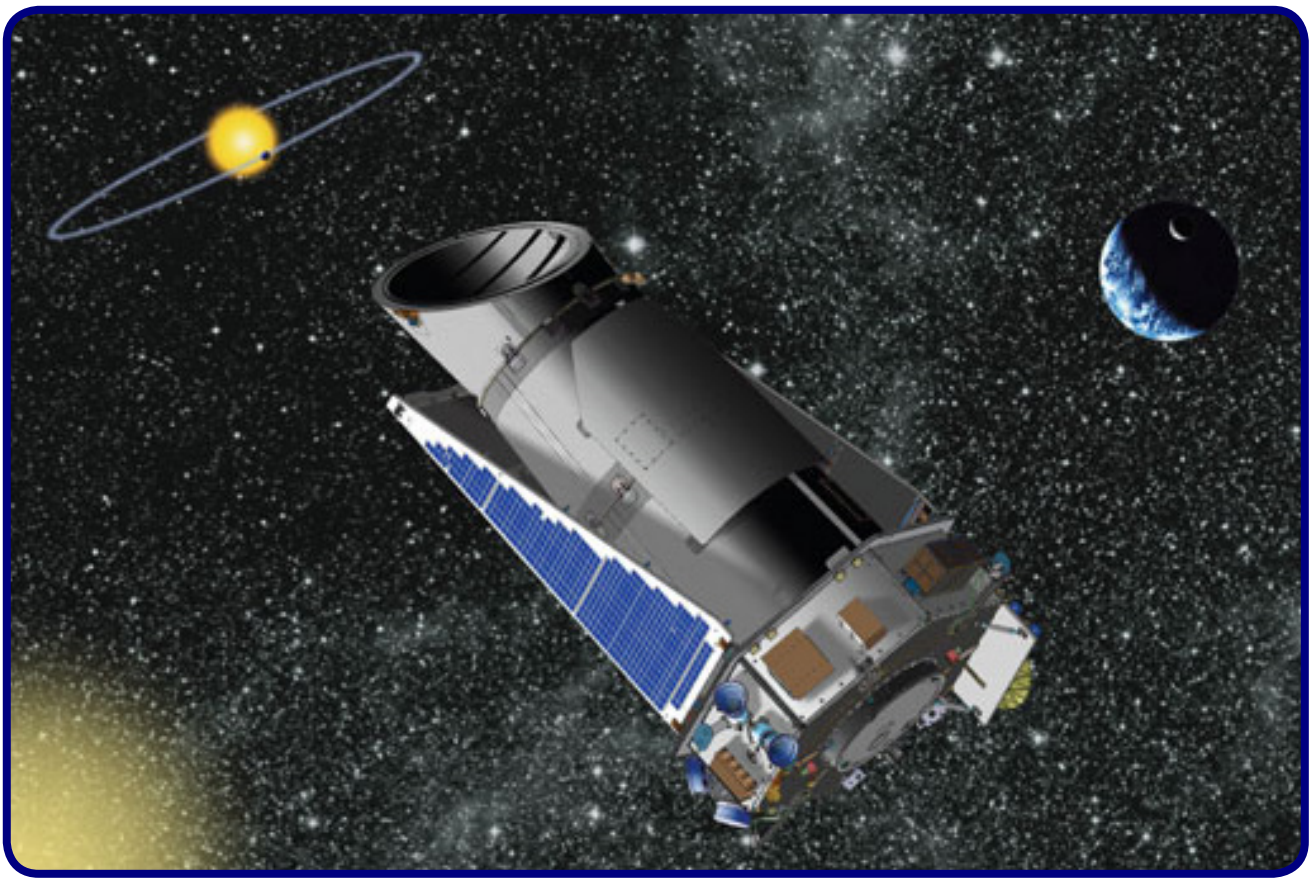

Image Caption: Kepler: NASA's first mission capable of finding Earth-size and smaller planets around other stars. The centuries-old quest for other worlds like our Earth has been rejuvenated by the intense excitement and popular interest surrounding the discovery of giant planets like Jupiter orbiting stars beyond our solar system. With the exception of the pulsar planets, all of the extrasolar planets detected so far are gas giants, approximately 150 as of 2005. The challenge now is to find terrestrial planets (habitable planets like Earth), which are 30 to 600 times less massive than Jupiter. (Credit: NASA)

zone. Finding such small planets, particularly in the habitable zone that is relatively far from their star, is a significant achievement.

The exoplanet Kepler-62f is only 40 percent larger than Earth, making it the exoplanet closest to the size of the Earth known to be in the habitable zone of its star, which is smaller and cooler than the Sun. Astronomers think that exoplanet Kepler-62f's small size makes it likely to have a rocky composition. The exoplanet Kepler-62e orbits on the inner edge of its star's habitable zone and is roughly 60 percent larger than Earth. The exoplanet Kepler-69c is 70 percent larger than the size of Earth and orbits in the habitable zone of a star that is similar to our Sun. Astronomers are uncertain about the composition of Kepler-69c, but its orbit of 242 days around a Sun-like star resembles that of our neighboring planet Venus.

Scientists do not know whether life could exist on the newfound planets, but their discovery signals that we are another step closer to finding a world similar to Earth around a Sun-like star. Measuring the frequency of such systems is a primary goal of Kepler. As a first step toward this goal, us-

ing publicly available Kepler data, astronomers announced in 2013 that six percent of red dwarf stars have habitable, Earth-sized planets. Since red dwarfs are the most common stars in our galaxy, this implies that the closest Earth-like planet could be just 13 light-years away and that there could be more than a billion such planets in our Milky Way galaxy. The question of whether or not this high frequency holds for Sun-like stars will be answered by the analysis of the full Kepler dataset.

Other Key Astrophysics Achievements in FY 2013

- Tremendous progress was made on the James Webb Space Telescope (JWST) during FY 2013. Two of the four science instruments were integrated into the Integrated Science Instrument Module (ISIM), along with supporting electronics, and the ISIM was installed into the cryogenic vacuum chamber at Goddard Space Flight Center for testing.

- The Stratospheric Observatory for Infrared Astronomy (SOFIA) completed extensive system upgrades and began its first full-scale year of community science, highlighted by the observatory's first-ever deployment to the Southern Hemisphere in July 2013. SOFIA achieved 100 percent of its science objectives during this deployment.

- NASA's newest astrophysics mission, the Nuclear Spectroscopic Telescope Array, or NuSTAR, and the European Space Agency's XMM-Newton mission teamed up to measure definitively, for the first time, the spin rate of a black hole with a mass 2 million times that of our Sun.

Earth Science

Studying the Earth as an integrated system is essential to understanding the causes and consequences of climate change and other environmental issues. Our planet is changing on all spatial and temporal scales. The purpose of NASA's Earth Science program is to advance our scientific understanding of Earth as a system and its response to natural and human-induced changes and to improve the ability to predict climate, weather, and natural hazards.

Study Investigates Carbon-Climate Feedback Hypothesis

A team of researchers used a state-of-the-art, high-performance computing and data access facility called NASA Earth Exchange at Ames Research Center to investigate the mechanisms underlying the relationship between carbon dioxide levels and increased temperatures. They analyzed widely available data of atmospheric carbon dioxide concentrations and global air temperatures between 1959 and 2011, while studying outputs from several dynamic global vegetation models. They showed a strong and persistent coupling between interannual variations of the carbon dioxide growth rate and tropical land-surface air temperature during 1959 to 2011.

The study provides support for the "carbon-climate feedback" hypothesis, asserting that a warming climate will lead to accelerated carbon dioxide growth in the atmosphere from vegetation and soils. Multiple Earth system processes, such as droughts and floods, also contribute to changes in the atmospheric carbon dioxide growth rate. The new finding demonstrates that observed temperature changes are a more important factor than rainfall changes in the tropics. It

also implies that the release of carbon dioxide from the tropical ecosystems will very likely be accelerated with future warming. Therefore, the study provides an important diagnostic tool for improved understanding of the contemporary and future global carbon cycle.

Landsat Data Continuity Mission Successfully Launched

On February 11, 2013, NASA successfully launched the Landsat Data Continuity Mission (LDCM) from Vandenberg Air Force Base in California. The two instruments aboard LDCM image the Earth's land surface and extend the Landsat 42-year land imaging data record for the United States and the world. The Landsat data record is the longest continuous Earth observing data record and provides invaluable reference material for our understanding of the changes that are ongoing in land use and land cover around the globe. The LDCM mission is a joint NASA/ United States Geological Survey (USGS) mission activity. Following a 90-day checkout, the USGS assumed responsibility for operational use.

Image Caption: The United Launch Alliance Atlas V rocket carries the Landsat Data Continuity Mission spacecraft, launched from Vandenberg Air Force Base on February 11, 2013. (Credit: NASA/Bill Ingalls)

Other Key Earth Science Achievements in FY 2013

- NASA scientists and university collaborators analyzed observations from the Gravity Recovery and Climate Experiment (GRACE) satellite mission to evaluate freshwater storage trends in the north-central Middle East, including portions of the Tigris and Euphrates river basins and western Iran, from January 2003 to December 2009.

- NASA-funded scientists analyzed more than a decade of satellite microwave radar data collected between 2000 and

2009 over Amazonia. The observations included measurements of rainfall from NASA's Tropical Rainfall Measuring Mission and measurements of the moisture content and structure of the forest canopy (top layer) from the SeaWinds scatterometer on NASA's QuikScat spacecraft. Their analysis showed that during the summer of 2005, 70 million hectares of pristine Amazonian forest experienced an extensive, severe drought. This megadrought caused drastic changes to the forest canopy that were detectable by satellite.

- NASA's analysis of Earth's surface temperature found that 2012 ranked as the ninth-warmest year since 1880. NASA scientists at the Goddard Institute for Space Studies compare the average global temperature each year to the average from 1951 to 1980. This 30-year period provides a baseline from which to measure the warming that Earth has experienced due to increasing atmospheric levels of heat-trapping greenhouse gases.

- NASA's Operation IceBridge provided laser altimetry and radar-derived ice thickness data to the Bedmap2 effort, significantly increasing the density of measurements in key areas. The Bedmap2 products provide new opportunities for detailed modeling of the past and future evolution of the Antarctic ice sheets.

- NASA-funded scientists used ice thickness and altimetry data — from Operation IceBridge, ground-based radar echo sounding, and interferometric synthetic aperture radar satellite data, along with reconstructions of surface accumulation — to complete a comprehensive survey of Antarctic ice shelves. They discovered that ice shelves lose the most mass to melting as opposed to calving, which had traditionally been thought to be the far-dominant mechanism for ice removal.

- NASA scientists analyzed twenty volcanic plumes produced during the 2000, 2001, 2002–03, 2006 and 2008 Etna eruptions, finding that volcanic aerosol dispersal and column height obtained by this analysis is in good agreement with ground-based observations. This work highlights the potential of the Multi-angle Imaging SpectroRadiometer to detect important volcanic plume characteristics that can be used to improve volcanic ash dispersion models.

Heliophysics

The domain of Heliophysics extends from the Sun all the way to the edge of the solar system, billions of kilometers beyond Pluto, where the Sun's magnetic field meets interstellar space. Heliophysics improves our understanding of basic physical processes throughout the solar system, and how the Sun, the major source of the energy throughout the solar system, impacts our technological society. Studying the interconnected system — the Sun, the heliosphere, Earth and other planets' space environments — is critical for predicting and mitigating the hazards associated with space exploration, both within Earth's magnetosphere and beyond. Human astronauts and robotic probes increasingly rely on forecasts of space weather as a matter of existential necessity. Heliophysics provides science understanding that leads to prediction of how space weather impacts the habitability of Earth and other worlds.

Van Allen Probes Begin Operations

Launched on August 30, 2012, the Van Allen Probes provide insight into the dynamics of the Earth's radiation belts and give scientists the data they need to make predictions for this critical region of space. Shortly into the mission lifetime, the Van Allen Probes discovered a third radiation belt. Since their discovery over 50 years ago, Earth's radiation belts have been considered to consist of two distinct regions (inner and outer belts) of high energy electrons and protons trapped by Earth's magnetic field. These donut shaped regions extend from above our atmosphere to about six Earth radii in the equatorial region. Shortly before the instruments on the Van Allen Probes began operations, the Sun had sent streams of high speed particles toward Earth that caused the radiation belts to swell. Then the Sun sent an interplanetary shock wave toward Earth and something happened no one had ever seen before: most of the particles in the outer belt were stripped out, leaving behind a remnant that persisted for a month. Within mere days of launch, the Van Allen Probes had shown scientists something that would require rewriting textbooks. Incorporating this new three-belt configuration into their models of the radiation belts offers scientists new clues about what causes the swelling and shrinking of the belts. The swelling of the radiation belts is of particular interest because the high energy particles can impact satellites and pose a threat to human space flight.

Spotting something new in space such as the third radiation belt has more implications than the simple knowledge that a third belt is possible. In a region of space that remains so mysterious, any observations that link certain causes to certain effects adds another piece of information to the puzzle. Scientists hypothesize that the eruption of a solar filament a few days before caused the shock wave that led to the formation of the third ring. In addition, the new belt was virtually annihilated four weeks after it appeared by another powerful interplanetary shock wave from the Sun.

The interplanetary shocks that both cause and disrupt the Earth's radiation belts start with activity on the Sun. While not directly related to this particular Van Allen Probe discovery, NASA's Solar Terrestrial Relations Observatory (STEREO-A) spacecraft observed one of the fastest coronal mass ejections (CMEs) ever recorded in July 2012. This was the most significant event in the current solar cycle, an especially big surprise as this cycle is the weakest since the dawn of the space age. If a CME of this magnitude had impacted the Earth's space environment, it may have caused a space weather event that could have greatly disrupted our technologically-based society. Certainly, CMEs of this magnitude greatly affect the Earth's radiation belts. The twin Van Allen Probes are well placed for us to further our understanding of the Sun-Earth connection.

Other Key Heliophysics Achievements in FY 2013

- NASA launched the Interface Region Imaging Spectrograph (IRIS) spacecraft on June 27, 2013. The IRIS images and spectra of fine structure in the interface region between the Sun's photosphere and corona will help scientists track how magnetic energy contributes to heating in the Sun's atmosphere. IRIS's first images show a multitude of thin, fibril-like structures that have never been seen before, revealing enormous contrasts in density and temperature occurring

throughout this region even between neighboring loops that are only a few hundred miles apart.

- The Magnetospheric Multiscale (MMS) mission is a Solar Terrestrial Probes mission comprised of four identically instrumented spacecraft that will use Earth's magnetosphere as a laboratory to study how the Sun's and Earth's magnetic fields connect and disconnect, explosively transferring energy from one to the other — a process that occurs throughout the universe, known as magnetic reconnection. This year MMS entered into the final development phase, assembly, integration, and test.

- In Antarctica in January 2013, the summer at the South Pole, scientists released 20 balloons, each eight stories tall, into the air to help answer an enduring space weather question: When the giant radiation belts surrounding Earth lose material, where do the extra particles actually go? The NASA-funded Balloon Array for Radiation-belt Relativistic Electron Losses (BARREL) mission seeks an answer to this question. During this month of bright, sunny days, the BARREL team launched a balloon every day or two into the circumpolar winds that circulate around the pole. Each balloon floated for anywhere from three to 40 days, measuring X-rays produced by fast-moving falling electrons high up in

Image Caption: This fisheye image shows NASA's four Magnetospheric Multiscale, or MMS, observatories inside the cleanroom at NASA's Goddard Space Flight Center in Greenbelt, Md. (Credit: NASA)

the atmosphere. BARREL works hand in hand with NASA's Van Allen Probes, which travel directly through the Van Allen radiation belts.

Planetary Science

Planetary science is a grand human enterprise that seeks to understand the history of our solar system and the distribution of life within it. NASA is at the frontier of a journey of scientific discoveries that are yielding a profound new understanding of our solar system. Robotic exploration is the current approach to planetary science and is the necessary precursor to the expansion of humanity beyond Earth. Ground-based research and observations supplement our space-based assets. NASA's strategic objective in planetary science is to ascertain the content, origin, and evolution of the solar system and the potential for life elsewhere. Underlying this goal are the themes of comparative planetology and habitability, the capacity of an environment, as it pertains to an entire planet or a specific region, to harbor life in the past, present, or future.

Near Earth Object Observation Efforts

In June 2013, the near-Earth object (NEO) observation program uncovered the 10,000th NEO. This object, an asteroid, has the provisional designation 2013 MZ4. The Panoramic Survey Telescope and Rapid Response System (Pan-STARRS) telescope, which sits atop the 3,000 meter [10,000-foot] Haleakala caldera on the island of Maui in Hawaii, discovered this new object. By definition, NEOs include both asteroids and comets that come within 45 million kilometers of Earth's orbit. Since NASA accepted the Congressional mandate for the NEO observation program 15 years ago, NASA-funded surveys first discovered 98 percent of all NEOs detected.

Earlier this year, on February 15, 2013, another near-Earth asteroid, 2012 DA14 (about 50 meters across) passed within 27,700 kilometers of the Earth's surface. This is below the Earth's ring of geosynchronous satellites, which orbit at 35,800 kilometers.

Curiosity Completes First Year of Operations

NASA's Mars Science Laboratory Curiosity Rover celebrated its first anniversary on Mars. Curiosity's goal is to assess the potential for Mars to have supported life. One year later, we are able to conclude that microbial life could indeed have lived on Mars. Four publications in *Science* document the findings.

About six months into the mission, Curiosity's MastCam imaged surface conglomerates: rounded pebbles of varying size "cemented" together that indicate an ancient streambed on the surface. A few months later, the Chemistry & Mineralogy and the Sample Analysis at Mars (SAM) instruments analyzed the area downstream, showing the water to be of low salinity and neutral pH, and the environment to contain all the elemental ingredients for life, such as carbon and nitrogen.

Mars largely established its atmosphere four billion years ago, according to repeated measurements of the Martian atmosphere by SAM, and the subsequent and substantial loss of the atmosphere occurred primarily through the atmosphere's top versus interactions with the surface. Additionally, measurements from the Radiation Assessment Detector characterized the radiation environment that future astronauts could potentially experience en route to Mars. Cu-

riosity is now headed towards its ultimate destination, Mt. Sharp.

Cassini Continues Extended Mission

NASA's Cassini spacecraft, now in its second extended mission, continues to amaze with new discoveries. Stunning new views from Cassini reveal the eye of the enormous hurricane locked in place at Saturn's north pole. The new views of Saturn's polar areas, the first in visible light, are possible due to recent changes made in Cassini's orbital path. Spring in the northern hemisphere means Saturn's north pole is illuminated by sunlight. The eye of the storm, about 1,250 miles wide, would stretch the distance between Washington, DC and Tulsa, OK. The wind in the storm's eye-wall blows more than four times the 73 mph of a hurricane force wind on Earth. Earth hurricanes feed off of warm ocean water, but there is no body of water close to these clouds high in the atmosphere of Saturn. Learning how these Saturnian storms use the water vapor that is available to them could tell scientists more about how all hurricanes are generated and sustained.

Wind-whipped waves and cyclones could occur on Saturn's moon Titan as summer arrives in the north toward the end of Cassini's mission. Recent new research reveals the possibility for wild weather on the only other body in the solar system besides Earth with stable liquid on its surface. Cassini observations of waves, or no waves, during this time will provide valuable clues about the composition of Titan's lakes and seas, and help determine the accuracy of the Global Circulation Model for Titan. Some of Titan's hydrocarbon lakes and seas are as large as the Great Lakes or Caspian Sea. Titan has a denser and much colder atmosphere than Earth's and less gravity. Its lakes and seas of ethane and methane have a lower surface tension than the equivalent bodies of liquid on Earth. These and other factors mean that even a light wind of one mile an hour could potentially whip up waves on Titan's lakes and seas. Winds are predicted to exceed the threshold for wild weather as Titan approaches summer solstice in 2017. Even tropical cyclones could conceivably occur over Titan's polar hydrocarbon seas as summer warms the northern hemisphere.

Other Key Planetary Science Achievements in FY 2013

- Lunar Atmosphere and Dust Environment Explorer (LADEE) is a robotic mission successfully launched September 6 from NASA's Wallops Flight Facility to orbit the Moon, gathering detailed information about the thin lunar atmosphere, conditions near the surface, and environmental influences on lunar dust.

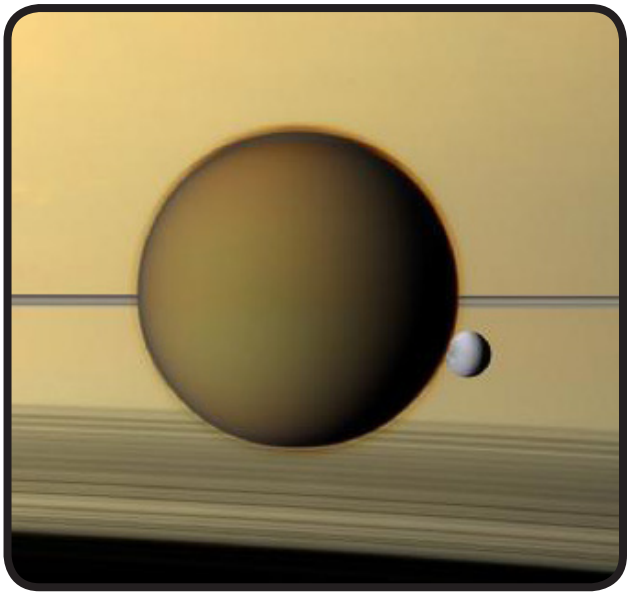

Image Caption: Saturn's third-largest moon, Dione, can be seen through the haze of its largest moon, Titan, in this view of the two posing before the planet and its rings from NASA's Cassini spacecraft. (Credit: NASA/JPL-Caltech/Space Science Institute)

- The Gravity Recovery and Interior Laboratory (GRAIL) mission, which ended in December 2012, revealed the origin of dense subsurface regions that make the Moon's gravity uneven, a phenomenon that affects the operations of lunar-orbiting spacecraft. They pinpointed the locations of large, dense regions called mass concentrations, or mascons, which are characterized by strong gravitational pull. Mascons lurk beneath the lunar surface and cannot be seen by normal optical cameras.

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

For decades, NASA investment in space technology has helped make the United States the global leader in space exploration and has significantly contributed to the technology-based US economy. NASA continues that legacy today through a balanced portfolio of technology development across a broad range of technical areas and at various stages of technical maturity. We invest in pioneering concepts that help develop the innovation community, transformative and crosscutting technology breakthroughs that enable more challenging missions, and new ideas and markets that strengthen the economy and contribute to US technological global leadership.

NASA Successfully Launches and Operates Smartphone Nanosatellites

During FY 2013, NASA demonstrated the lowest-cost satellites ever flown in space. On April 21, 2013, two copies of PhoneSat 1.0 and an early prototype of PhoneSat 2.0 rode into orbit aboard the maiden flight of Orbital Science Corporation's Antares rocket. The PhoneSats successfully operated for six days before deorbiting as planned.

A small team of engineers working on NASA's PhoneSat at the Ames Research Center aims to rapidly evolve satellite architecture and incorporate the Silicon Valley approach of "release early, release often" to small spacecraft. To achieve this, NASA's PhoneSat design makes extensive use of commercial off-the-shelf components, including an unmodified, consumer-grade smartphone. Specifically, PhoneSats are built around a Nexus One, made by HTC Corp. and running Google's Android operating system. Out-of-the-box smartphones already offer a wealth of capabilities needed for satellite systems, including fast processors, versatile operating systems, multiple miniature sensors, high-resolution cameras, GPS receivers, and several radios.

The successful on-orbit operation of PhoneSat demonstrated that a smartphone operating system can be used in lieu of a traditional, custom-built spacecraft Command and Data Handling system. This approach has the potential to significantly reduce spacecraft software costs for some applications.

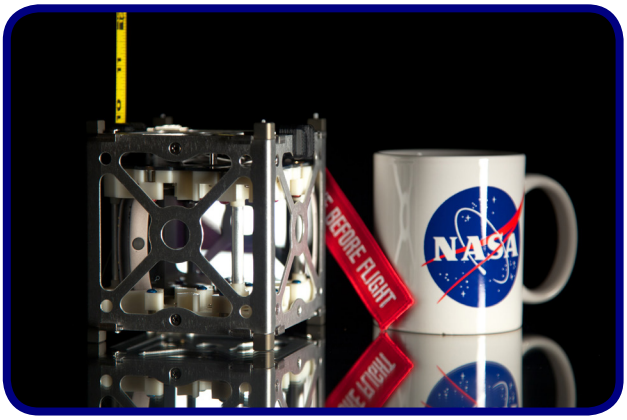

Image Caption: Roughly the size of a coffee cup, PhoneSat 1.0 is a capable satellite that leverages off-the-shelf smartphone technology. (Credit: NASA)

In addition, the mission demonstrated the use of the smartphone's sensors to determine spacecraft orientation and its camera for Earth observations. Commercial off-the-shelf parts also included a watchdog circuit that monitors the systems and reboots the phone if it stops sending radio signals.

Smartphones offer the potential for flying small, low-cost, powerful satellites for atmospheric or Earth science, communications, or other space-borne applications. They also may open space to a whole new generation of commercial, academic, and citizen-space users. In the coming years, NASA will continue to demonstrate new innovative small spacecraft systems, including distributed networks of small satellites. Such distributed networks offer the potential to replace traditional large spacecraft systems at significantly reduced costs.

NASA Successfully Tests New Cryogenic Propellant Tank Technology

During FY 2013, NASA completed a major space technology development milestone by successfully testing a pressurized, large cryogenic propellant tank made of out-of-autoclave composite materials. In the past, propellant tanks have been fabricated from metals. Switching to composite construction could lead to rocket propellant tanks that are 30 percent lighter and cost 25 percent less than state-of-the-art metal tanks. Such a reduction in weight would dramatically increase the performance capabilities of future space systems. A potential initial target application for this cryogenic technology is an upgrade to the upper stage of the SLS heavy-lift rocket. Other potential applications include commercial launchers, in-space propellant storage, and future vehicle and lander systems.

Built by Boeing at their Tukwila, Washington facility, the 2.4-meter (almost 8-foot) tank arrived at Marshall Space Flight Center in the first quarter of FY 2013 to begin testing. Engineers insulated and inspected the tank and then put it through a series of pressurized tests to measure its ability to contain liquid hydrogen at extremely cold temperatures. Engineers cooled the tank down to –423 degrees Fahrenheit and underwent 20 pressure cycles, changing the pressure up to 135 psi.

The testing experience with the 2.4-meter tank validates the team's novel tooling approach, manufacturing techniques, and testing procedures, paving the way for the testing next spring of the largest out-of-autoclave composite cryogenic tank ever built. It is this 5.5-meter (over 18-foot) tank that could lead to a significant increase in SLS payload capability.

NASA Develops SSTIP

In February 2013, NASA completed the development of the Strategic Space Technology Investment Plan (SSTIP), an actionable plan that lays out the strategy for developing technologies essential to the pursuit of NASA's Mission and national goals. NASA made improvements to TechPort (a technology portfolio data collection and analysis tool), and used the system to collect detailed information about more than 1,000 projects in NASA's technology portfolio. NASA analyzed the Agency portfolio to minimize duplication, identify gaps, identify potential partnerships, and in July 2013 made strategic decisions that ensure technology investment dollars are optimized to provide critical capabilities that support missions and longer-term national needs.

In June 2013, NASA announced the Asteroid

Grand Challenge to "find all asteroid threats to human populations and know what to do about them" with the sole purpose of engaging in partnerships to generate public benefit. In addition, NASA announced several new prizes and crowdsourcing opportunities relating to Unmanned Aerial Systems airspace operations, International Space Station longeron shadowing, Robonaut vision, and Earth science big data to enable new partners to help NASA solve tough problems.

NASA continued to promote the availability of NASA technologies for use by the US public and private sectors, and accelerate the technology to market cycle, enabling significant capabilities to produce benefits more quickly. As part of this effort, NASA completed 5,111 technology-related products, including patents, licenses, and mission use agreements.

Through the course of the year, NASA established 50 partnerships with US industry, or other US agencies, and other entities. These strategic partnerships were designed to expand and strengthen NASA's ability to execute its Mission and enable NASA to leverage funding, capabilities, and expertise within and outside the Agency to address technology barriers and advance technology.

Other Key Achievements in FY 2013

- Successfully tested the first 3D printed rocket engine injector.
- Awarded a Level 1 prize at the Sample Return Robot 2013 Centennial Challenge.
- Completed major milestones for the Laser Communication Relay Demonstration project.
- Completed major milestones for the Solar Sail Demonstration project.
- Delivered a three kilowatt non-flow-through fuel cell stack for testing at Glenn Research Center.
- Completed NASA's first fully manifested flight on UP Aerospace's SpaceLoft System.
- Selected 65 graduate students as the 2013 class of Space Technology Research Fellows.
- Supported the development of the Global Exploration Roadmap Technology Development Map, a comprehensive international data repository of technology development activities.
- Supported the Space Frontier Foundation in their annual "New Space Business Plan Competition", the most prominent business plan competition of its kind, with the goal of encouraging American space entrepreneurship and generating US commercial activity and other public benefits in the process.

Strategic Goal 4:
Advance aeronautics research for societal benefit.

Aviation is a transportation mode that connects nations, cities, businesses, and people to support a growing and vital global economy. Within the United States, aviation is essential to economic well being. Since our establishment, NASA has continually advanced America's aviation system to improve our quality of life and productivity on

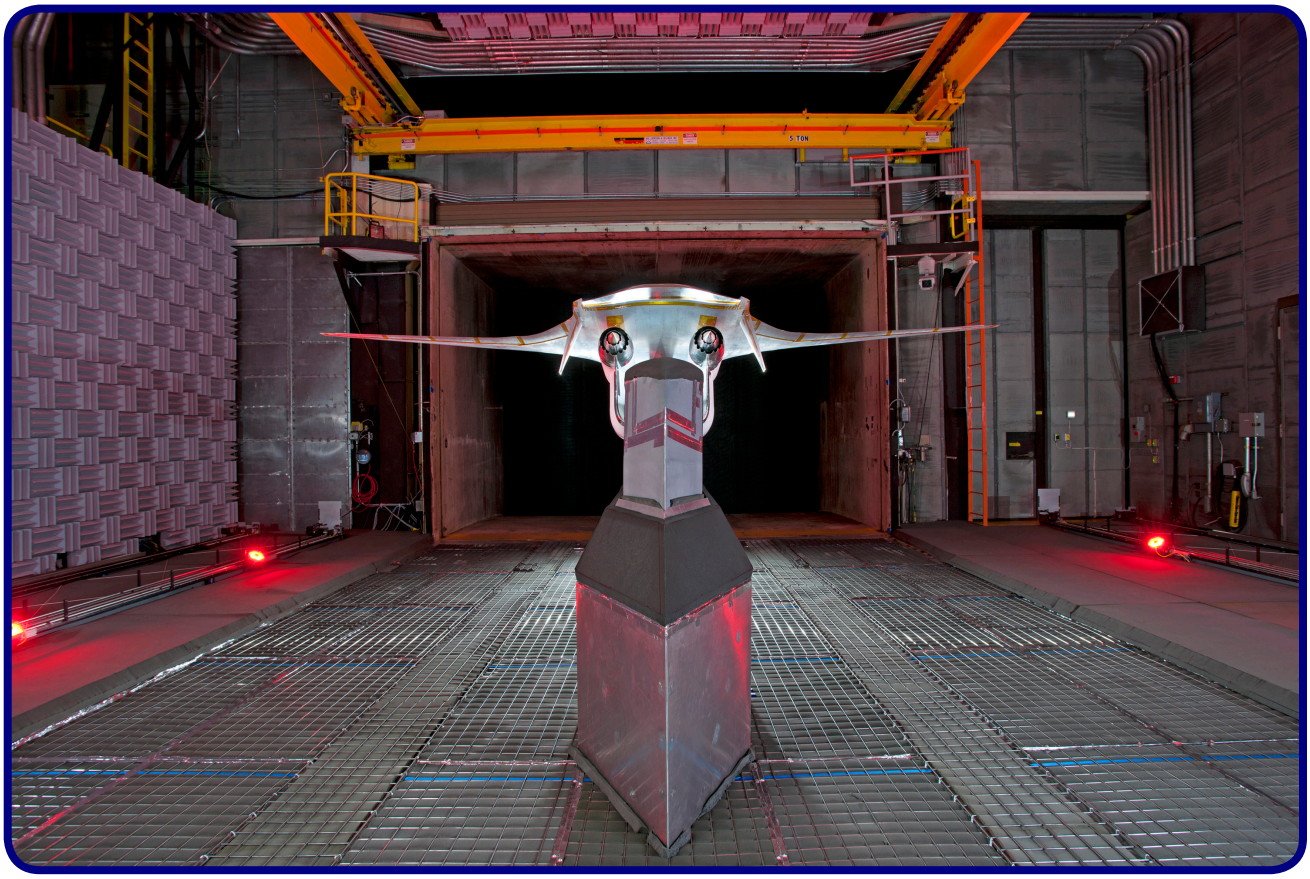

Image Caption: The Environmentally Responsible Aviation Project successfully completed testing in the Langley Research Center's 14x22-Foot Subsonic Wind Tunnel to demonstrate the noise reduction potential of the Hybrid Wing Body aircraft configuration. (Credit: NASA/Sean Smith)

Earth. NASA contributes unique innovations to aviation through our research activities. These innovations serve as key enablers for the vital role of US commercial aviation in driving American commerce and supporting safe, environmentally-sustainable mobility. Our role is to explore early-stage concepts and ideas, develop new technologies and operational procedures through foundational research, and demonstrate the potential of promising new vehicles, operations, and safety technology in relevant environments. We are focused on the most appropriate cutting edge research and technologies to overcome a wide range of aeronautics technical challenges for the Nation's and the globe's current and future air transportation system.

NASA Works to Reduce Barriers for Unmanned Aircraft Integration in to the National Airspace System

The vast emerging potential of unmanned aircraft to perform commercial, defense, scientific, and emergency management services is driving the critical need for less restrictive access by Unmanned Aircraft Systems (UAS) to the National Airspace System (NAS). Existing Federal Aviation Regulations (FAR) procedures and technologies do not allow routine UAS access to the NAS. To reduce these barriers, NASA is investing in research that will transition concepts, technologies, algorithms, and knowledge to the Federal Aviation Administration (FAA) and other stakeholders to help them in de-

fining the requirements, regulations, and issues for routine access.

A primary component of the UAS research is the development and utilization of a unique test environment that integrates real unmanned vehicles flying in restricted airspace virtually embedded in actual and simulated air traffic data with air traffic control facilities and ground control stations. This test environment will allow for the safe but realistic testing of UAS integration concepts and flight characteristics. This testing is planned for 2015 and 2016.

In 2013, NASA successfully conducted a series of characterization tests of this complex test environment in order to establish a baseline of the system's capabilities. Ames Research Center was responsible for conducting the tests, with participation from Dryden Flight Research Center and Glenn Research Center (GRC) running components at their facilities. The GRC S-3B "Viking" aircraft was utilized as a live flight participant. The major objectives of the tests were to measure and characterize times from data generation to reception (i.e., system latencies) and overall data volume capabilities (i.e., throughput) at well defined points in the system. Every objective of the test series was met.

NASA Transfers Delay-Reducing Software to FAA

NASA presented the prototype software for the Precision Departure Release Capability (PDRC) to the FAA in August 2013. With PDRC, controllers will be able to improve the overall efficiency of air traffic management by reducing missed or delayed departures and allowing more aircraft to depart within a given timeframe. Tests of the software conducted during the past few years show that PDRC could help improve compliance with the departure time by up to 80 percent, thereby improving the use of slots in the overhead stream of air traffic that can go empty due to timing issues on the ground.

Two series of exercises conducted at NASA's North Texas Research Station, near the Dallas/Fort Worth International Airport, tested and evaluated the PDRC software, beginning in May 2012 and concluding earlier this year. During the evaluation, the prototype PDRC system was used by FAA controllers to schedule departure times for real, operational airline flights. The PDRC software tool is the latest example in a long history of NASA's technical contributions to the aviation community.

Other Key Achievements in FY 2013

- NASA successfully completed testing in the Langley Research Center's 14x22-Foot Subsonic Wind Tunnel to demonstrate the noise reduction potential of the Hybrid Wing Body (HWB) aircraft configuration. This testing investigated the combined airframe and jet engine noise using a HWB model and a compact jet engine noise simulator. The testing also characterized the ability of the HWB airframe to "shield" emitted noise. Results indicated that the HWB configuration will meet the goal of 42 decibel noise reduction from existing noise standards. Numerous upgrades were made to the wind tunnel to enable this testing, further augmenting this critical national asset for future research needs.

- NASA made significant progress toward characterizing the emissions from alternative fuels by successfully completing in-flight and ground-based tests in April 2013 to measure the gaseous and par-

ticulate emissions from aircraft engines burning an alternative biofuel. Preliminary results indicate that the biofuel blends tested may substantially reduce the emission of black carbon, sulfates, and organics. Future efforts will assess contrail formation using these fuel blends to further ensure that there are no adverse effects on the environment.

- NASA successfully replicated multiple engine power loss events that have occurred when aircraft encountered high ice water content icing conditions. Aircraft flying through high altitude thunderstorms encounter high concentrations of ice crystals. Under certain conditions, these ice crystals may cause ice to form inside a jet engine in a way that can degrade its performance, potentially leading to engine power loss. NASA used the data gathered during this testing to calibrate and validate a computational tool used to assess the risk of engine ice crystal icing.

- A field trial was conducted with American Airlines for NASA's Dynamic Weather Routing (DWR), a tool that continually analyzes flight trajectories and weather conditions, and then suggests course corrections to avoid the trouble. Field trials like these are the final step required before NASA delivers the DWR tool to carriers and system developers for improved flight efficiencies and cost savings.

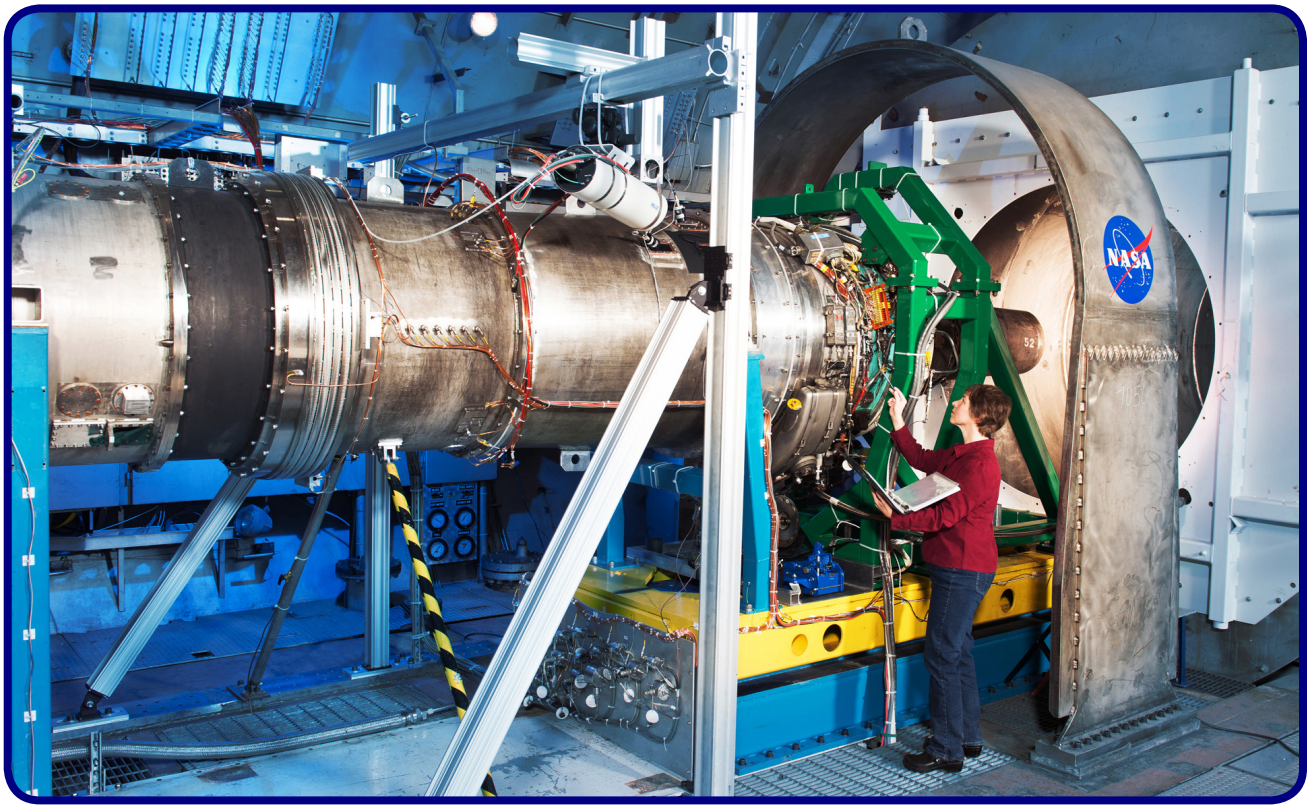

Image Caption: Judy Van Zante, NASA Glenn icing cloud specialist, was the first person to calibrate the high altitude ice crystal cloud environment necessary to cause a loss of engine power during an engine test in the PSL. (Credit: NASA)

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

NASA accomplishes its mission by effectively managing our people, technical capabilities, and infrastructure. We provide secure and effective information technologies and services that enable NASA's mission. NASA continues to renew and sustain its capabilities into fewer, more efficient facilities and ensure that NASA's key technical capabilities will be available in the future to support the missions that require them. We attract and advance a highly skilled, competent, and diverse workforce. Diversity, sustainability, and innovation are keys to NASA's adaptability, and an integral part of NASA's mission success. NASA strives for an organizational culture and work environment that includes varying perspectives, education levels, skills, life experiences, and backgrounds to enable excellence and allow individual and the organization to maximize potential. The support and participation of everyone at NASA, including executive leadership, managers, supervisors, and employees, are critical components of successful implementation.

Safety and Mission Success

NASA's Safety and Mission Success (SMS) program successfully implemented its strategic objective of enhancing mission success of NASA's programs, projects, and operations, while ensuring the safety and health of the public and the NASA workforce in FY 2013. SMS demonstrated this by:

- Zero fatalities or permanent disabling injuries to the public resulting from NASA activities.
- Maintaining a Total Case Rate and Lost Time Case Rate that exceeded the goals of the President's Protecting Our Workers and Ensuring Reemployment initiative.
- Reducing the non-mission failure damage to NASA assets.

Diversity: Work Culture

NASA's Office of Diversity and Equal Opportunity (ODEO) and Office of Human Capital Management (OHCM) co-led Agency-wide efforts to implement the Agency's Diversity and Inclusion (D&I) Strategic Implementation Plan. All NASA Centers developed their own Center D&I Plans, designed to align with the Agency's Plan as well as to address their local cultural issues.

NASA's talented, unique, and innovative workforce is the main reason for the Agency's celebrated history and its reputation for achieving the seemingly impossible. NASA's Mission requires every employee to seek ways to promote advances in his or her discipline area. Sustained efforts to advance, both at the individual and organizational levels require an innovative approach to the work of NASA's Mission as well as an inclusive culture that values and supports the people who make it possible.

NASA conducted the Virtual Executive Summit (VES), which demonstrated that relevant Agency communications, collaboration, and learning can be effectively delivered in a distributed environment that engages employees both virtually and onsite. This series of sessions, activities, and interactions conducted in an online environment over a 30-day period allowed flexibility in how and when Agency executives from across the country participated. In addition to achieving

cost savings, VES supported the Agency's efforts to create an innovative workplace where important Agency work can be conducted anywhere and anytime.

Information Technology

NASA's Office of the Chief Information Officer (OCIO) has made significant advances in the transition of NASA's information technology (IT) infrastructure services from a Center-based model to an enterprise-based IT management and provisioning model. In FY 2013, the Agency realized $32.7 million in cost savings through continuous focus on consolidating legacy IT contracts with the objective to reduce Agency costs while improving customer experience, security, and governance. The IT infrastructure services in this broad effort include enterprise business and management applications, integrated network and communications services, end user services, service desk capabilities, and web services and technologies. NASA's final enterprise-wide contract in this series of IT Infrastructure Integration Program (I3P) contracts was awarded in 2013 for Web Enterprise Service Technologies. The completion of these I3P enterprise IT contracts has enabled the OCIO to set forth on the transformation of IT infrastructure services to more efficiently deliver the mission supporting IT capabilities required for NASA's next generation of missions.

Sustainability

NASA continues essential infrastructure repair and revitalization activities as well as repair by replacement of facilities. Repair by replacement projects are those that provide sustainable and energy efficient infrastructure by replacing old, inefficient, deteriorated buildings with new, efficient, high-perfor-

Image Caption: Building N232 (Sustainability Base) is a 48,000 sf building at Ames Research Center with a LEED Platinum rating. This sustainable building produces more electricity than it uses. (Credit: NASA)

mance buildings.

NASA continues to reduce infrastructure by disposing of unneeded facilities, and demolish unneeded Shuttle infrastructure such as the mate/demate device at DFRC and facilities no longer used at Plum Brook Station, Sandusky, OH.

NASA continues to evaluate, in coordination with the Department of Defense (DoD), the status of its aeronautics test capabilities to ensure that tactical maintenance and repair, along with strategic capability investment decisions, have been considered from a national point-of-view relative to long-term requirements and risks. In doing so, NASA ensures the availability of a critical suite of aeronautical test facilities that are capable of supporting research, development, test, and evaluation goals and objectives for NASA and the Nation.

Strategic Capabilities Assets Program (SCAP) continued to sustain and ensure that the test facilities identified as essential to the Agency were maintained in a state of readiness. SCAP maintained the skilled workforce and performed preventative maintenance necessary to keep these facilities available to meet current and future program requirements.

Among its accomplishments, SCAP's specialized workforce supported the design and relocation of major test equipment from the Johnson Space Center arc jet testing capability to the Ames Research Center. The relocation was completed in FY 2013. In addition, NASA assessed its thermal vacuum chamber testing capabilities across its field Centers. Four under-utilized chambers at the Jet Propulsion Laboratory, Kennedy Space Center, and Marshall Space Flight Center were identified for divestment and are going through the disposition process. SCAP also provided design and final systems check-out and verification support for upgrades at Johnson Space Center's Thermal Vacuum Chamber A.

Environmental

NASA released a Draft Environmental Impact Statement (DEIS) that evaluates potential environmental impacts of proposed demolition and environmental cleanup activities of property administered by NASA at the Santa Susana Field Laboratory in California. The National Environmental Policy Act requires analysis of potential impacts of certain actions undertaken by a Federal agency. The DEIS is intended to inform NASA decision-makers, regulating agencies, and the public of the potential environmental consequences of the proposed demolition of buildings and structures and the proposed environmental cleanup actions for groundwater and soil at the NASA-administered portion of the Santa Susana Field Laboratory. The DEIS considers a range of remedial technologies that might be implemented to achieve the proposed groundwater and soil remediation goals. NASA will use the DEIS to consider the potential environmental, economic, and social impacts of the proposed remediation action.

Other Key Achievements in FY 2013

- Recognizing that cybersecurity is critical to protect NASA's sensitive information, including personally identifiable information (PII), we completed the data-at-rest (DAR) full-disk encryption for all NASA-issued laptops (with the exception of laptops that have received a waiver), as well as desktops with sensitive data. This effort significantly mitigates the risk of critical data loss in the event that a computer

is lost or stolen.

- The Agency continued to improve governance for business systems and IT infrastructure. Our increased visibility into Center IT budgets led to the identification of potential Agency-wide projects to improve service, security, and efficiency. We also improved visibility into institutional IT within the Agency's budget submission, enabling further opportunities to drive efficiencies.

- The 21st Century Space Launch Complex initiative has made great strides toward the modernization and transformation of Kennedy Space Center into a multi-user spaceport benefiting both government and commercial launch service providers. In the Vehicle Assembly Building, existing platforms were removed to prepare the facility to accommodate many different launch vehicles.

- Significant environmental projects were done at the Launch Complex-39 launch pads, and the crawler way has a new foundation that will enable the transport of multi-ton hardware to the launch pads. The Launch Control Center has been configured to support multiple commercial users, and construction has begun on an upgraded spacecraft processing facility to provide world-class processing capabilities.

- The TDRS Constellation provides critical communications services to a diverse fleet of spacecraft. To sustain this critical capability, the eleventh TDRS spacecraft launched in January, and the next TDRS spacecraft is being prepared for launch early next year.

Image Caption: The first of NASA's three next-generation Tracking and Data Relay Satellites (TDRS), known as TDRS-K, launched at 8:48 p.m. EST Wednesday, January 30, 2013 from Cape Canaveral Air Force Station in Florida. TDRS-K was lifted into orbit aboard a United Launch Alliance Atlas V rocket from Space Launch Complex-41. (Credit: NASA)

- The Aeronautics Test Program completed a condition assessment of the ground support facilities, systems, and equipment within the ARMD Flight Test Project portfolio. This assessment provides valuable knowledge of the ground-based assets that support critical flight testing and will inform strategic investment decisions to ensure that relevant flight testing capabilities continue to be available to support the research, development, test, and engineering milestones of NASA and DoD programs.

- The Aeronautics Test Program provided a new, operational engine icing research capability at the Propulsion Simulation Laboratory in FY 2013. The first test completed successfully in February and validated the design performance of the new engine icing capability. This new capability will enable research into the high-altitude engine icing problems encountered by commercial aircraft and will help ensure that relevant testing capabilities are available to support the research, development, test, and engineering milestones of NASA and national programs.

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.

Public outreach, partnerships, and external assistance are important methods for communicating NASA's Mission and inviting broad participation, allowing NASA to truly make space for all people. The Agency strives to include as many voices as possible. Fostering the interest of students in science, technology, engineering, and mathematics (STEM) education, particularly those who are traditionally underrepresented in STEM fields, aids greatly in meeting both national and Agency goals.

Education Highlights

The Office of Education manages the portfolio that continues the Agency's tradition of investing in the Nation's education programs and supporting the country's educators who play a key role in preparing, inspiring, exciting, encouraging, and nurturing the young minds of today who will be the workforce of tomorrow. In FY 2013, NASA continued to pursue three major education goals:

- Strengthening NASA and the Nation's future workforce.

- Attracting and retaining students in science, technology, engineering and mathematics, or STEM, disciplines.

- Engaging Americans in NASA's Mission.

NASA education continues to establish partnerships that enable NASA to promote effective utilization of current resources as we reach wider and more targeted audiences of participants. NASA education enters into partnerships with innovative organizations that have wide ranging areas of expertise and access to and knowledge of communities identified to yield national impact.

NICE Project

The NASA Innovations in Climate Education (NICE) project has created an extensive national network of climate change projects and enthusiasts as a result of its collaboration with Federal agencies, minority serving institutions, organizations, community colleges, and school districts with significant

Image Caption: Shaun Smith, a flight projects education specialist at the NASA Dryden-affiliated AERO Institute in Palmdale, Calif., demonstrates imagery from an infrared camera to two student attendees at the 2013 Salute to Youth. (Credit: NASA/Ken Ulbrich)

underrepresented and underserved enrollment and reach. This network has helped to maintain a portfolio of 71 project activities focused on strengthening the climate change education skills of current and future educators and learners alike.

The NICE project engaged learners across the education spectrum, with 3,116 undergraduate students and 287 graduate and postdoctoral researchers participating in NICE activities. Over 4,686 elementary and secondary students and 2,661 educators were engaged in NICE project activities. With a goal of increasing the number of underrepresented and underserved students in STEM and specifically within the climate change community, the reported NICE project student demographic information indicates that 55 percent of the student population was female, 43 percent were American Indian, Alaskan Native, or Native Hawaiian/Pacific Islander, and 23.4 percent were Black or African American.

The Competitive Program for Science Museums and Planetariums Plus Opportunities for NASA Visitor Centers and Other Informal Education Institutions responds to Congressional direction to establish “a competitive program as authorized by section 616 of PL 109-155 for science museums and planetariums to enhance programs related to space exploration, aeronautics, space science, Earth science or microgravity.” The new “Nature Research Center” wing of the North Carolina Museum of Natural Sciences in Raleigh, NC opened its doors for 24 solid hours to celebrate its grand opening. NASA demonstrated virtual tours of the Solar Sys-

tem, cloud-based citizen science opportunities, games, and NASA Discovery Kiosks in the event. For more information, see: http://naturalsciences.org/programs-events/grandopening. The new wing features NASA-funded exhibits on Earth and space science, including Beyond Our Planet. To view an image of the exhibit, see: http://www.flickr.com/photos/naturalsciences/7008557421/in/set-72157630050237368.

The Louisiana Art and Science Museum in Baton Rouge, LA completed and released its first planetarium show, We Choose Space, initiating its Future Space: Engaging the Public After Shuttle project. Produced by a project partner at the Houston Museum of Natural Science (HMNS), the 24-minute long show has been seen by 9,388 students, teachers, and the public in portable planetariums in the Houston area and by 6,192 people in the HMNS Burke Baker Planetarium. It is offered for licensing through http://www.spaceupdate.com, and available for preview online at http://tinyurl.com/wechoosespace. Focusing on human spaceflight after the Space Shuttle, We Choose Space is the first planetarium show told completely by astronauts (Tom Jones, Scott Parazynski, and Gene Cernan) and a famous reporter (Walter Cronkite), and to use fisheye photography from inside the ISS. An educator guide, created by a master's student in Science Teaching, accompanies the show.

Office of Communication

NASA's Office of Communications informs the public and engages them in NASA's missions. We have a responsibility to provide accurate, timely information on the Agency's Mission and activities. We also have a responsibility to make the American space program open and transparent, and connect the public with our programs and projects.

Continuing to broaden NASA's reach, NASA initiated Google+ Hangouts on Air as a way to communicate information and engage different audiences. It did not take long before the tool, allowing easy participation from anywhere on and off the globe, became a staple of NASA communications.

On July 10, 2013, NASA successfully hosted its first press conference by Hangout, proving that news could be presented through virtual tools, saving the government and reporters travel costs while still allowing for full participation by participants and media. NASA also hosted the first Hangout from space, connecting thousands of members of the public with astronauts onboard the International Space Station. There have been other high-profile Hangouts, including one with astronauts in space talking to the cast of Star Trek: Into Darkness.

With new missions taking center stage, NASA communications focused on building an integrated communications plan to showcase operations by our commercial cargo partners, with guest operations at SpaceX and Orbital Sciences launches, comprehensive coverage of the first-ever contract cargo flight to the ISS, and the inauguration of America's newest spaceport at Wallops Island, Virginia.

An integrated communications process was developed and put into practice based on the efforts of the Communications Coordinating Council. NASA accelerated plans to build a comprehensive portfolio of all communications activities across the Agency.

MissionSTEM Highlights

In November 2012, NASA's Office of Diversity and Equal Opportunity launched its MissionSTEM Web site to provide our grantee

institutions, including university and college STEM programs, as well as science centers and museums across the country, with important information on helping to ensure equal educational opportunities, fostering STEM talent, and sharing promising practices for diversity and inclusion. The Web site offers a wealth of content in these areas, designed both to broaden the scope of NASA's contact with its grant recipients and to encourage grantees to communicate with each other in advancing equal opportunity, diversity, and inclusion.

As a key purpose of MissionSTEM is to reach a broader swath of our grant recipient institutions, we measure the success of our efforts in part through the number of visits to the site. On average, MissionSTEM has had 12,000 hits per month, with an average of 2,500 unique visitors viewing at least one page.

NASA posted on MissionSTEM the D&I Leadership Series, a series of videos of academic leaders from across the country speaking on what they have done at their institution to advance diversity in STEM. The series includes an introductory message from the NASA Administrator, and a series of videos by academic leaders discussing specific themes in this arena, for example, increasing the numbers of minorities in STEM. The D&I Leadership Series is a first in creating a nationwide forum for NASA grantees to share promising practices on increasing diversity and enhancing inclusion efforts in STEM.

NASA also developed the Tech Series, which consists of videos of NASA scientists, engineers, and technologists, led off by the NASA Chief Technologist and the Associate Administrator for Space Technology, that offer insights into the real-world application and societal impact of NASA science and engineering work. The Tech Series is specifically designed to appeal to a broadly diverse audience of young people. By offering a first-hand look into the enormous contributions of NASA work, the Tech Series serves to educate, engage, and inspire the Nation's youth.

Financial Performance

CFO Letter

February 17, 2014

The National Aeronautics and Space Administration (NASA) is committed to the highest standards of financial accountability, transparency and reporting in support of the Nation's aeronautics and space missions. I take great pride in reporting that for the third year in a row NASA received an unmodified "clean" opinion on our financial statements, with no material weaknesses or significant deficiencies.

This Fiscal Year 2013 Summary of Performance and Financial Information discloses and reports on the Agency's key performance and financial outcomes for the fiscal year. In his Message on page i, Administrator Bolden outlined the expansive breadth of the Agency's challenging portfolio and the progress we have made in 2013. As the complexity and diversity of the mission portfolio have grown, the Agency's financial systems and processes have evolved to meet expanding information needs. Similar to the progress in our mission portfolios, NASA has made significant progress in our financial management. NASA has significantly improved our reporting of the annual costs to achieve each of the agency's strategic goals, enhanced our procedures for estimating environmental cleanup costs and mitigated impacts of budget uncertainty in our programmatic guidance.

This Summary of Performance and Financial Information provides detailed highlights of our 2013 performance and more information on the intersection between NASA's program and financial management. I am proud to report that NASA is in substantial compliance with the Federal Financial Management Improvement Act for fiscal year 2013. In addition, NASA was a recipient of the Association of Government Accountants' Certificate of Excellence in Accountability Reporting (CEAR) for our FY 2012 Agency Financial Report (AFR).

We are pleased with our achievements and remain committed to ensuring sound financial management. I appreciate the continued support of the entire Agency, with special thanks to the Office of Inspector General. More detailed financial reporting is available in our Agency Financial Report, released in December 2013.

Elizabeth (Beth) Robinson
Chief Financial Officer

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Financial Overview

NASA has made significant improvements to the integrity of its financial management systems, processes and reports. The Agency overcame significant financial reporting challenges to achieve unmodified audit opinions in FY 2011 and FY 2012. In FY 2013, NASA focused on maintaining its unmodified opinion while improving efficiencies and reducing costs. For example, during FY 2013 NASA continues to achieve its administrative savings goals through spending reductions in travel, printing, supplies, and advisory services. These savings, which are associated with the Administration's management agenda to promote efficient spending, enabled the Agency to increase funding for research and development contracts, facilities enhancements and grants. NASA is committed to effectively and efficiently managing funds appropriated by Congress to incur obligations for goods and services necessary to execute NASA mission goals within the apportionment limits from Office of Management and Budget (OMB) and in compliance with federal financial accounting standards.

NASA's financial values are a critical component of the Agency's effective financial management. The information provided in the next section reflects how NASA meets its financial values of ensuring financial stewardship, and thereby promoting effective resource management, ensuring the integrity of financial data, enhancing capabilities and delivering a positive customer experience.

NASA Financial Goals and Accomplishments

NASA established a set of financial goals that build upon existing capabilities, processes, products and tools to deliver timely, accurate and effective information to programmatic and institutional decision makers. The overarching theme for all of the goals is to build the capabilities needed to deliver value-added products and services such as budgets, reports, analyses, policies and processes. The sections below explain each of the goals and describe key actions taken to accomplish each goal.

Financial Goal 1: Enhance Capabilities

The objectives of this goal include: strengthening the knowledge, skills and abilities of the financial management workforce; ensuring knowledge sharing and transfer; improving processes, procedures and policy; and, aligning systems with mission and customer needs. To accomplish this goal, NASA has:

- Provided training and development opportunities that strengthen critical knowledge, skills and abilities in accounting, auditing, budgeting and resources management.
- Enhanced analytical capabilities to ensure the availability of timely and accurate flows of financial information used for operating and policy decision making.
- Enhanced data analysis and reconcilia-

tion skills through recruitment and staff training.

- Provided opportunities for participation in external committees, such as those offered by the U.S. Department of the Treasury, OMB, and the Federal Accounting Standards Advisory Board.

- Ensured financial system compliance with federal financial management systems requirements, including new requirements for financial reporting through the Government-wide Treasury Account Symbol Adjusting Trial Balance System (GTAS), which will be effective in FY 2014.

- Implemented an electronic invoicing solution that will improve payment cycle time, reduce interest penalties, and reduce long-term operating cost.

- Expanded eBudget dataset to include periodic budgetary and key decision points for projects' cost and schedule information.

- Developed a summary level dashboard that provides comparative financial performance reports aligned with the Agency's strategic goals.

Financial Goal 2: Ensure Financial Stewardship

The objectives of this goal include: maintaining a nimble and flexible posture; delivering analytics that add value; providing metrics that measure and drive appropriate performance; ensuring accuracy and accountability through internal controls; and, ensuring operations are completed with the highest standards of integrity. To accomplish this goal, NASA has:

- Enhanced the analysis and monitoring of financial performance and developed options for the most efficient use of financial resources.

- Improved analysis and deobligation of unliquidated obligation balances to improve the quality and timeliness of decisions related to the use of those funds.

- Increased the use of less resource-intensive Cross-Agency meetings, such as teleconferencing, electronic meeting tools, and video-conferencing.

- Reduced print requirements and increased on-line repositories such as OMB's MAX website and other internal NASA on-line tools to share information and encourage transparency.

- Revised and updated internal control activities in the Agency's Continuous Monitoring Program to strengthen data analysis and reporting.

- Strengthened account balance fluctuation analyses to explain inter-period changes.

- Strengthened internal controls to address OMB guidance on data quality for USASpending.gov.

- Performed a review of its programs for the past seven years to determine risk of significant improper payments and has determined in each year that none of its programs are susceptible to a high risk of significant improper payments.

- Enhanced the integration of financial and

performance management through the reporting of net cost and results of operations by strategic goal.

Financial Goal 3: Deliver a Positive Customer Experience

The objectives of this goal include: strengthening relationships with customers; demonstrating value added products, services and advice with an Agency perspective; and, delivering quality products, services and advice in a timely manner. To accomplish this goal, NASA has:

- Established Communities of Practice to promote information sharing and benchmarking opportunities across various internal stakeholder communities.
- Prepared financial statements and reports that meet the needs of internal and external customers for reliable and timely financial information.
- Enhanced capabilities for accurate cost-tracking and accounting for customer agreements with federal and non-federal entities and to respond timely and accurately to customer inquiries.
- Improved transparency of budget decisions with internal stakeholders.
- Built strong positive relationships with internal and external stakeholders to support the Agency's budget formulation and execution process.

Image Caption: A supermoon rises behind the Washington Monument, Sunday, June 23, 2013, in Washington. This year the Supermoon is up to 13.5% larger and 30% brighter than a typical Full Moon is. This is a result of the Moon reaching its perigee — the closest that it gets to the Earth during the course of its orbit. During perigee on 23 June the Moon was about 221,824 miles away, as compared to the 252,581 miles away that it is at its furthest distance from the Earth (apogee). (Credit: NASA/Bill Ingalls).

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Financial Highlights

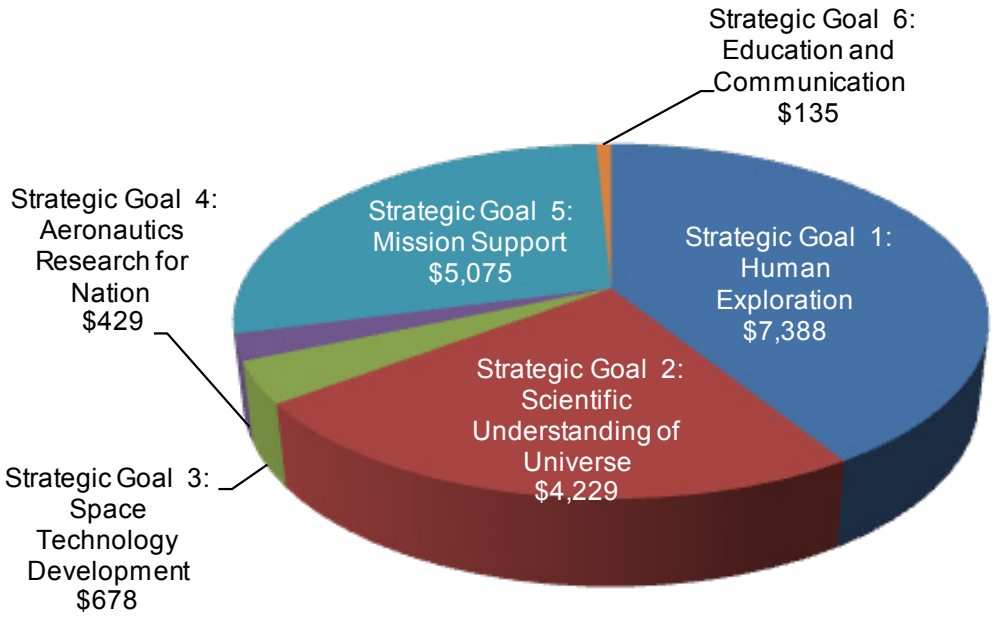
This section provides highlights of NASA's financial performance for FY 2013. The highlights explain the impacts of program and operational decisions on financial results. Key components of this section include:

Results of Operations:	An overview of how NASA used its financial resources to achieve its goals in FY 2013.
Sources of Funding:	An explanation of the type and amount of funds NASA received in FY 2013.
Balance Sheet:	A comparative report of assets, liabilities and net position for FY 2013 and FY 2012.

Results of Operations

The Statement of Net Cost, summarized in the chart and table below, presents net costs of operation by strategic goal and for NASA overall. NASA's strategic goals are described in the Mission Performance section of this Agency Financial Report. The net cost of operations represents gross costs incurred less revenue earned for work performed for other government organizations and private entities.

Net Cost of Operation by Strategic Goal
(In Millions of Dollars)



The accompanying table provides comparative net cost for FY 2013 and FY 2012 by strategic goal.

Cost by Strategic Goal	2013	2012	Change	% Change
(In Millions of Dollars)				
Strategic Goal 1 – Human Exploration				
Gross Costs	$ 7,662	$ 8,129	$ (467)	-6%
Less: Earned Revenue	274	331	(57)	-17%
Net Costs	7,388	7,798	(410)	-5%
Strategic Goal 2 – Scientific Understanding of Universe				
Gross Costs	$ 5,790	$ 5,543	$ 247	4%
Less: Earned Revenue	1,561	1,349	212	16%
Net Costs	4,229	4,194	35	1%
Strategic Goal 3 – Space Technology Development				
Gross Costs	$ 678	$ 291	$ 387	133%
Less: Earned Revenue	—	—	—	0%
Net Costs	678	291	387	133%
Strategic Goal 4 – Aeronautics Research for Nation				
Gross Costs	$ 524	$ 550	$ (26)	-5%
Less: Earned Revenue	95	104	(9)	-9%
Net Costs	429	446	(17)	-4%
Strategic Goal 5 – Mission Support				
Gross Costs	$ 5,430	$ 5,356	$ 74	1%
Less: Earned Revenue	355	290	65	22%
Net Costs	5,075	5,066	9	0%
Strategic Goal 6 – Education and Communication				
Gross Costs	$ 135	$ 160	$ (25)	-16%
Less: Earned Revenue	—	—	—	0%
Net Costs	135	160	(25)	-16%
Net Cost of Operations				
Total Gross Costs	$20,219	$20,029	$ 190	1%
Less: Total Earned Revenue	2,285	2,074	211	10%
Net Costs	**$17,934**	**$17,955**	**$ (21)**	**0%**

Net cost of operations for FY 2013 was $17.9 billion, a decrease of $21 million, compared to FY 2012. Gross costs at $20.2 billion, were higher by $190 million, or 1%, compared to FY 2012 at the entity level. Earned revenue for goods and services provided to other federal agencies and the public was $2.3 billion, an increase of $211 million, or 10%, compared to FY 2012. The primary drivers of year-to-year changes for NASA's six strategic goals are explained below:

Strategic Goal 1 – Human Exploration

Gross Costs decreased by $467 million, or 6%, for this strategic goal. Cost changes were primarily due to the following programs:

The Space Launch System (SLS) program had lower costs in FY 2013 for the Aerial Regional-scale Environmental Surveyor (ARES-1) and Multi-Purpose Crew Vehicle (MPCV) projects due to the program being cancelled in FY 2011. This was offset by an increase in Space Launch System (SLS) program costs to ramp-up for the Launch Vehicles project to complete the full element implementation, which included the successful completion of the preliminary design review for the SLS heavy-lift rocket. This enabled the project to focus on the next milestone in the continuing verification process, in which NASA will move from formulation to implementation. The first SLS mission will launch an uncrewed Orion spacecraft, scheduled for 2017. The Commercial Crew program had higher costs in FY 2013 due to numerous Commercial Crew Integrated Capability (CCiCap) awards to various aerospace companies to provide services for NASA's Commercial Crew Program (CCP) to develop an integrated crew transportation system.

Earned revenue decreased by $57 million, or 17%, primarily due to a reduction of earned revenue relating to various Space Operations projects with the Department of Defense.

Strategic Goal 2 – Scientific Understanding of Universe

Gross Costs increased by $247 million, or 4%, for this strategic goal. Cost changes were primarily due to the following programs:

The Joint Polar Satellite System (JPSS) program had higher costs due to the acceleration of hardware fabrication. In FY 2013, the JPSS program reached key decision points in the review of the overall soundness of the JPSS. The JPSS mission is targeting the Critical Design Review in early 2014, with launch scheduled for late 2016. NASA works on the JPSS mission in partnership with the National Oceanic and Atmospheric Administration (NOAA).

James Webb Space Telescope (JWST) program costs were higher due to the acceleration of hardware fabrication to meet target milestones. NASA accomplished a FY 2013 program goal to begin assembly of the Optical Telescope Element (OTE) backplane support fixture. The addition of the backplane support frame was a major milestone toward the completion of the assembly of the backbone of the JWST. The JWST mission is targeting the Critical Design Review in early 2014. The launch is scheduled in 2018.

Costs were lower in FY 2013, as expected, for the Mars Exploration Program as hardware deliveries for the mission were completed. The mission achieved a major milestone in FY 2013 with the successful completion of its Critical Design Review. The Mars Atmospheric and Volatile Evolu-

tionN (MAVEN) spacecraft is scheduled for launch in late 2013.

Earned revenue increased by $212 million, or 16%, primarily for the JPSS program. The increase in earned revenue was for NASA services provided in FY 2013 to support testing of the JPSS, which cleared its final major design review.

Strategic Goal 3 – Space Technology Development

Gross Costs for this strategic goal increased by $387 million, or 133%, in FY 2013 compared to FY 2012. NASA heightened its pursuit of initiatives to build a strong, advanced technology development foundation that will enable technology readiness of new NASA missions, and improve overall mission cost management. In this effort, NASA focused on identifying specific technologies based on their criticality in extending human presence beyond low Earth orbit and their ability to dramatically further scientific exploration of the solar system. The cost changes were primarily due to the following programs:

Crosscutting Space Tech Development program costs were higher in FY 2013 for the Low-Density Supersonic Decelerator project (LDSD), which completed key milestones in the development of new atmospheric deceleration technologies to support future exploration missions to Mars and across the solar system. The LDSD completed three successful rocket sled tests of the "SIAD-R," a Supersonic Inflatable Aerodynamic Decelerator, the first of three innovative deceleration systems now in development.

The NASA FY 2013 budget included an increase in activity in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs to encourage small business owners to provide technical innovations. In FY 2013, the SBIR program awarded several new Phase 2 contracts to small high-technology companies to participate in government sponsored research and development efforts in key technology areas. Phase 2 contracts are intended to expand on the results of the Phase 1 activity, with the objective of infusing SBIR/STTR Program technologies into NASA programs and projects.

The Exploration Technology Development program had higher costs in FY 2013 in several projects: the Cryogenic Propellant Storage and Transfer project completed a major space technology development milestone by successfully testing a pressurized, large cryogenic propellant tank made of composite materials. The Human Exploration Telerobotics project tested the Surface Telerobotics exploration concept, in which an orbiting spacecraft remotely operates a robot on a planetary surface. In FY 2013, International Space Station (ISS) astronauts were able to remotely control the Planetary Rover at Ames Research Center from space.

Advanced Exploration Systems (AES) program costs increased for various projects. The Morpheus/ALHAT (Autonomous Landing and Hazard Avoidance Technology) project progressed toward a previously unplanned flight demonstration in FY 2013 and building new Morpheus vehicles. In another area, The Bigelow Expandable Activity Module (BEAM) was a new project in FY 2013, focused on the development of a new addition to the International Space Station that will use the orbiting laboratory to test expandable space habitat technology, currently planned for 2015.

Strategic Goal 4 – Aeronautics Research for Nation

Gross Costs decreased by $26 million, or 5%, primarily due to the reduction of costs in the Fundamental Aeronautics programs resulting from combining hypersonic and supersonic research projects into a single project in order to focus on fundamental research for high-speed flight. In FY 2013, the Subsonic-Fixed Wing, Subsonic-Rotary Wing and Supersonics projects ended, and the Fixed Wing and High Speed projects were started. In FY 2013, NASA, along with other federal agencies and industry partners, collaborated on the design of an airplane wing that can provide high lift during takeoff and landing, and also smooth cruising at the altitude level. Activity also included a series of flights using the Agency's DC-8 flying laboratory to study the effects of alternate biofuel.

Earned Revenue decreased $9 million, or 9%, primarily related to less program activity, and related shared costs for various aeronautics projects with other federal agencies, including the Federal Aviation Administration.

Strategic Goal 5 – Mission Support

Gross Costs increased by $74 million, or 1%, primarily for activity in the Exploration Ground Systems (EGS) program. The EGS program is modernizing and transforming the Florida launch infrastructure and range complex at Kennedy Space Center in support of the Orion MPCV and SLS programs.

Earned Revenue increased by $65 million, or 22%, this year primarily due to an increase in institutional reimbursable activity with various Federal Agencies including the Department of Homeland Security.

Strategic Goal 6 – Education and Communication

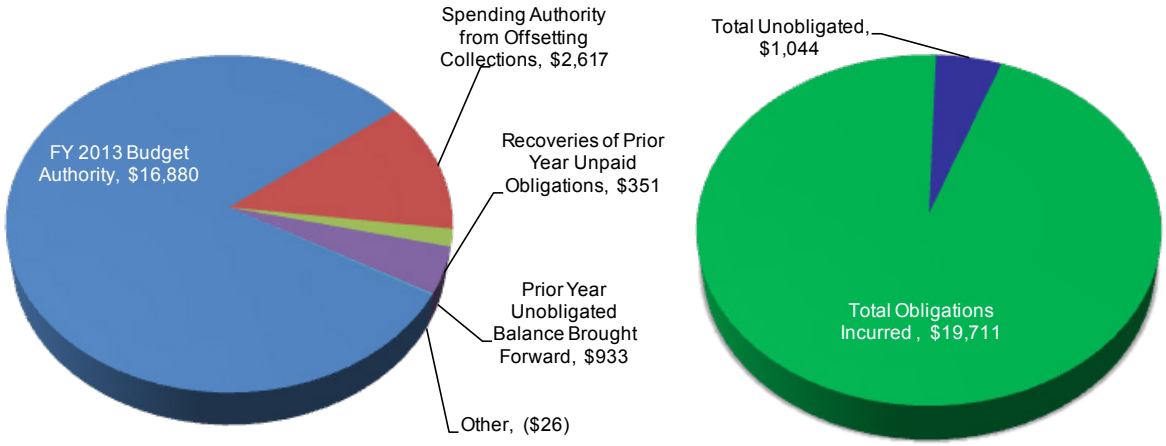
Gross Costs decreased by $25 million, or 16%, primarily as a result of NASA's efforts to realign resources to improve the effectiveness of the Agency's' Science, Technology, Engineering and Mathematics (STEM) projects. In FY 2013, the STEM Education and Accountability program consolidated the K-12 STEM Education, Informal STEM Education, and Higher Education STEM Education projects and activities. NASA aligned the activities for each of the projects, which enabled the Agency to improve operational efficiency and costs to administer these projects.

Image Caption: In this two-minute exposure, the Soyuz TMA-11M rocket heads from Baikonur Cosmodrome in Kazakhstan towards orbit Thursday, Nov. 7, 2013 (Nov. 6 in the U.S.), bound for a docking at the International Space Station about six hours later. (Credit: NASA/Bill Ingalls)

Sources of Funding

The Combined Statement of Budgetary Resources details resources available to NASA for the fiscal year and the status of those resources at year-end. The majority of NASA funds were provided through Congressional appropriations. NASA also receives budget authority in the form of earned revenue to offset Agency costs incurred to fulfill reimbursable agreements for goods and services with Federal and non-Federal entities. The sources and uses of budgetary resources are summarized in the chart and table below.

Budgetary Resources
(In Millions of Dollars)



Line Item	2013	2012	Change	% Change
(In Millions of Dollars)				
FY 2013 Budget Authority	$ 16,880	$ 17,771	$ (891)	-5%
Spending Authority from Offsetting Collections	2,617	2,842	(225)	-8%
Recoveries of Prior Year Unpaid Obligations	351	365	(14)	-4%
Prior Year Unobligated Balance Brought Forward	933	677	256	38%
Less: Other	26	37	(11)	-30%
Total Budgetary Resources	**$ 20,755**	**$ 21,618**	**$ (863)**	**-4%**
Total Obligations Incurred	19,711	20,685	(974)	-5%
Total Unobligated	**$ 1,044**	**$ 933**	**$ 111**	**12%**

New Budget Authority which accounted for 81% of total budgetary resources for FY 2013, is provided by Congress primarily in two-year appropriations. New Budget Authority decreased by $891 million, or 5%, compared to FY 2012 primarily due to an increase in the rescission and sequester of appropriations, which was $968 million higher compared to FY 2012.

Spending Authority from Offsetting Collections decreased by $225 million, or 8%, in FY 2013 primarily due to a reduction in unfilled customer orders primarily for the Joint Polar Satellite System Program on behalf of the National Oceanic and Atmospheric Administration (NOAA).

Recoveries of Prior Year Unpaid Obligations which represent funds that were obligated in prior years that were subsequently deobligated, decreased $14 million, or 4%, compared to FY 2012. The change is attributed to higher recoveries in FY 2012 compared to FY 2013 primarily relating to contracts that supported the Space Shuttle Transition and Retirement activities and the Earth System Science Pathfinder program for the Orbiting Carbon Observatory -2 project.

Prior Year Unobligated Balance Brought Forward represents prior year funds that were not obligated and remain available for obligation in the current year. These funds increased by $256 million, or 38%, compared to FY 2012, primarily due to balances for outstanding reimbursable activity as of the end of FY 2012 that were brought forward into FY 2013, compared to zero balances brought forward into FY 2012.

Obligations Incurred of $19.7 billion represents the amount of available budgetary resources obligated to accomplish the Agency's goals. Obligations incurred decreased by $974 million, or 5%, compared to FY 2012. The decrease was due to lower obligations to support the Space Shuttle, International Space Station, and Mars Exploration programs. This was slightly offset by an increase in contract obligations to support the Earth Systematic Missions program for the Geostationary Operational Environmental Satellite-R Series.

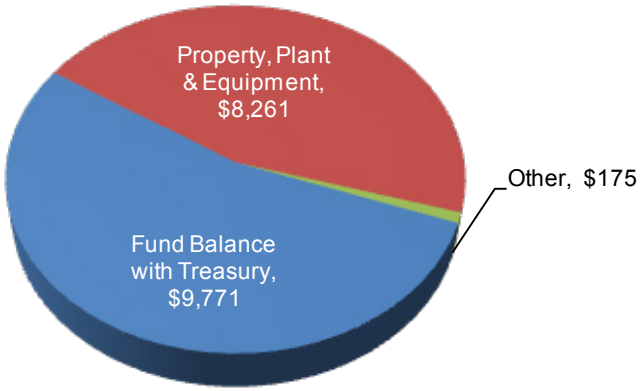
Other of ($26) million represents the amount of expired obligated and unobligated appropriation balances that are canceled as of September 30, 2013. There was no appreciable change in the amount of Other from FY 2012 to FY 2013.

Balance Sheet

Assets

Total assets for FY 2013 were $18.2 billion, a decrease of $828 million, or 4%, from FY 2012. The major categories of assets are summarized in the chart and table below.

NASA Assets
(In Millions of Dollars)



Line Item	2013	2012	Change	% Change
(In Millions of Dollars)				
Fund Balance with Treasury	$ 9,771	$ 9,901	$ (130)	-1%
Property, Plant & Equipment	8,261	8,906	(645)	-7%
Other	175	228	(53)	-23%
Total Assets	**$ 18,207**	**$ 19,035**	**$ (828)**	**-4%**

The largest category of assets was **Fund Balance with Treasury (FBWT)** and represents NASA's cash balance with the U.S. Department of the Treasury. There was no appreciable change in FBWT from FY 2012 to FY 2013.

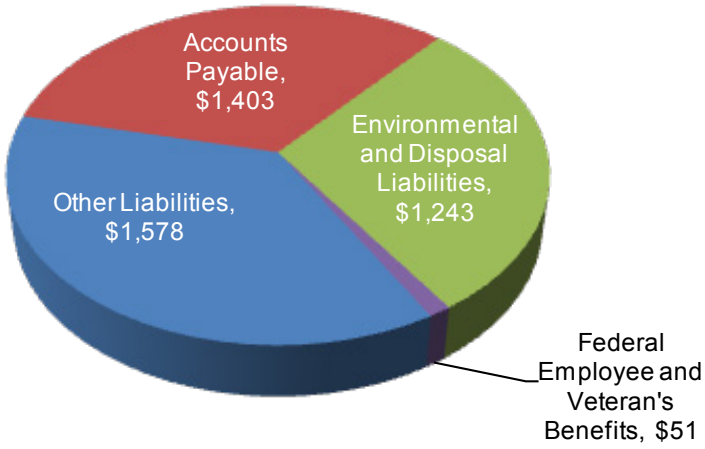
Property, Plant and Equipment (PP&E), the next largest category of assets, decreased by $645 million, or 7%, from FY 2012 to FY 2013. The primary contributing factor in the decrease in PP&E was an increase in accumulated depreciation associated with the International Space Station.

The **Other** category represents the amount of investments, accounts receivable, and other assets as of September 30, 2013. There was no appreciable change in the amount of Other from FY 2012 to FY 2013.

Liabilities

Total liabilities for FY 2013 was $4.3 billion, a decrease of $10 million, from FY 2012. The major categories of liabilities are summarized in the chart and table below.

NASA Liabilities
(In Millions of Dollars)



Line Item	2013	2012	Change	% Change
(In Millions of Dollars)				
Other Liabilities	$ 1,578	$ 1,607	$ (29)	-2%
Accounts Payable	1,403	1,459	(56)	-4%
Environmental and Disposal Liabilities	1,243	1,169	74	6%
Federal Employee and Veteran's Benefits	51	50	1	2%
Total Liabilities	**$ 4,275**	**$ 4,285**	**$ (10)**	**0%**

Other Liabilities primarily represents an estimate of accrued contractor costs incurred but not yet paid, as well as accrued payroll and related costs. Other Liabilities decreased by $29 million, or 2%, from FY 2012.

Accounts Payable is the amount owed to other entities for goods and services received. Accounts Payable decreased by $56 million, or 4%, from FY 2012.

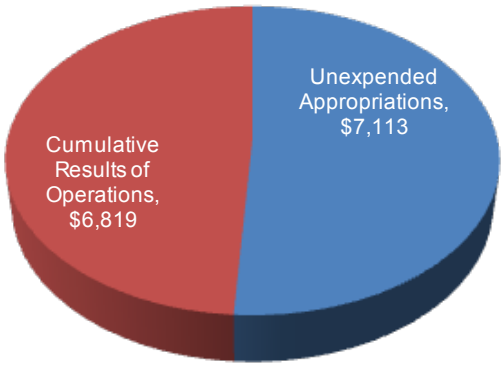
Environmental and Disposal Liabilities increased by $74 million, or 6%, from FY 2012 to FY 2013. The change was primarily due to an increase in estimated restoration project costs and asbestos clean-up costs, which is a new reporting requirement for FY 2013.

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. There was no appreciable change in the amount from FY 2012 to FY 2013.

Net Position

Net Position, comprised of unexpended appropriations and cumulative results of operations, decreased by $818 million, or 6%, from FY 2012. The major categories of net position are summarized in the chart and table below.

NASA Net Position
(In Millions of Dollars)



Line Item	2013	2012	Change	% Change
(In Millions of Dollars)				
Unexpended Appropriations	$ 7,113	$ 7,234	$ (121)	-2%
Cumulative Results of Operations	6,819	7,516	(697)	-9%
Total Net Position	**$ 13,932**	**$ 14,750**	**$ (818)**	**-6%**

Unexpended Appropriations were lower by $121 million, or 2%, for FY 2013 compared to FY 2012. The decrease is primarily due to the FY 2013 rescission and sequester of appropriations.

Cumulative Results of Operations were lower by $697 million, or 9%, for FY 2013 compared to FY 2012. There was no appreciable change in Appropriations Received and Appropriations Used.

Limitation of the Financial Statements

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

Image Caption: This is a photo of the complete Interface Region Imaging Spectrograph (IRIS) observatory with the solar arrays deployed. This is taken in a large clean tent at Lockheed Martin prior to vibration testing and prior to installation of the flight multi-layer insulation blankets. The solar arrays have just been deployed using flight commands. (Credit: Lockheed Martin)

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Systems, Controls, and Legal Compliance

Image Caption: The base of the Soyuz solid rocket boosters are seen at Building 112 on the Baikonur Cosmodrome, in Baikonur, Kazakhstan. The Soyuz rocket carried Expedition 37 Soyuz Commander Oleg Kotov, NASA Flight Engineer Michael Hopkins, and Russian Flight Engineer Sergei Ryazansky to the International Space Station on September 25, 2013 for a five and a half-month mission aboard ISS. (Credit: NASA/Victor Zelentsov)

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Systems, Controls and Legal Compliance

Management Assurances

Administrator's Statement of Assurance

December 6, 2013

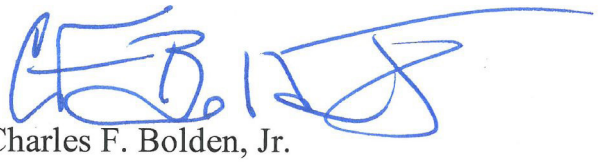
The National Aeronautics and Space Administration (NASA) management is responsible for establishing and maintaining effective internal control and financial management systems that meet the objectives of the *Federal Managers' Financial Integrity Act* (FMFIA), the *Federal Financial Management Improvement Act* (FFMIA), as well as all other related laws and guidance. NASA is committed to a robust and comprehensive internal control program. We recognize that ensuring the effective, efficient, economical, and responsible use of the resources that have been provided to the Agency is not only good stewardship, but also the right approach to maximize our progress toward the realization of our mission goals. Integrity and ethical values are emphasized throughout the Agency and communicated both formally and informally through training, codification in policy, and through organizational norms and culture. 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 Fiscal Year 2013 annual assessment of the effectiveness of internal controls over operations and compliance with applicable laws and regulations in accordance with FMFIA and the Office of Management and Budget (OMB) Circular A-123, *Management's Responsibility for Internal Control*. In addition, in support of Public Law (P.L.) 113-2, the Disaster Relief Appropriations Act, 2013 which provided funds to the Agency for construction and environmental compliance and restoration, our assessment included a review of applicable policies and key controls designed to mitigate Disaster Relief Act funding risks. Further, to ensure compliance with the Government Charge Card Abuse Prevention Act of 2012 and OMB Memorandum 13-21, *Implementation of the Government Charge Card Abuse Prevention Act of 2012*, our assessment included a review of applicable policies and key controls designed to ensure such compliance. 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, 2013, were operating effectively and no material weaknesses were found in the design or operation of the internal controls.

In addition, NASA's Office of the Chief Financial Officer performed an assessment of the effectiveness of internal controls over financial reporting in compliance with OMB Circular A-123, Appendix A-*Internal Control over Financial Reporting*. Based on the results of the evaluation, there were no material weaknesses identified in the design or operation of these controls. NASA provides reasonable assurance that internal controls over financial reporting are operating effectively as of June 30, 2013. Finally, in accordance with the requirements of the FFMIA, we assessed the implementation and maintenance of NASA financial management systems. We found that these substantially comply with Federal financial management systems requirements, applicable Federal accounting standards, and the U.S. Government Standard General Ledger at the transaction level.

In conclusion, NASA makes an "unqualified statement of assurance" that its internal controls for FY 2013 were operating effectively.

NASA will continue its commitment to ensuring a sound system of internal control exists over operations, financial reporting and financial systems and will continue to monitor and enhance its quality assurance activities.



Charles F. Bolden, Jr.
Administrator

Financial Systems Strategies

NASA's Core Financial (CF) management system is the Systems Applications & Products (SAP) Enterprise Resources Planning (ERP) Suite. The CF system is an Agency-wide solution for all Centers and installations and has served as NASA's financial accounting system of record since 2003. It is the foundation of NASA's ability to achieve its financial management objectives and management of the budget. Since its initial implementation, CF has been enhanced and expanded to demonstrate measurable progress toward achieving compliance with Federal Managers' Financial Integrity Act (FMFIA) and Federal Financial Management Improvement Act (FFMIA), and an unmodified financial audit opinion.

To date, NASA has implemented the following modules: funds management, financial accounting, sales and distribution, investment management, materials management, controlling (cost), project systems, and real estate, as well as a Contractor Cost Reporting (CCR) extension. Collectively, these integrated components make up NASA's financial system of record for financial statements, external reports, project analysis, and management control. Transactions within the integrated modules and interfaces are recorded on a real time basis. The SAP ERP is supported by other commercial off-the-shelf (COTS) software, NASA developed applications, and interfaces with systems managed by other federal agencies.

NASA's CF integrates with the Agency's FedTraveler system, an eGov initiative providing Agency-wide travel processing. The only major Development/ Maintenance/ Enhancement (DME) investment this year was for the e-Gov Travel System 2 with Concur Government Edition (CGE) which is slated to replace the FedTraveler system in FY 2014.

The Performance Measures Module (PMM) is a part of the Budget Formulation and Execution (BFEM) system and it is targeted to replace the manual performance measures process that represents how the Agency collects and reports quarterly and annual performance measures. In 2011, NASA entered into an agreement with the U.S. Department of the Treasury to implement PMM to facilitate the input of the Agency's performance data, and provide consolidated, archiving capability while creating new efficiencies in workload and outputs to all stakeholders. Current and future PMM and extension capabilities are part of NASA's strategy to meet current GPRA Modernization Act 2010 (GPRAMA) mandates and OMB requirements for federal strategic planning, performance management and reporting.

NASA's Contract Management Module (CMM) / PRISM is used as a hub to modernize/standardize NASA's contract writing. It provides an integrated Agency-wide procurement solution that interfaces real time with CF and promotes NASA's internal initiatives to optimize business operations.

NASA is in the process of implementing Wide Area Workflow, the Department of Defense e-invoicing solution, that will improve payment cycle time, reduce interest penalties, and reduce long-term operating cost.

These systems, along with others, such as Business Warehouse/Cognos, eBudget, Metadata Manager and Bankcard are all

integrated within the NASA Financial Management System environment. The NASA Enterprise Applications Competency Center (NEACC) operates and maintains the broad spectrum of NASA's Enterprise Applications for nine lines of business (for example: Financial Management, Procurement, and Human Capital), with an emphasis on fully integrating business process expertise with application and technical know-how. Administrative and transactional business activities are supported by the NASA Shared Services Center (NSSC) and support the following functional areas: financial management, human resources, procurement, information technology and Agency business support.

In sum, NASA CF, its interfacing systems and Agency and Center personnel support the execution of NASA's Strategic and Project Performance Goals, and allow NASA to effectively manage enterprise data and information per the Agency's vision for Enterprise Architecture. The integrated nature of the business systems and processes have strengthened NASA's internal controls and transparency. The CF System enables NASA in achieving its Enterprise Architecture target state goal of systems rationalization and providing cost-effective and reliable applications to support NASA's mission.

Looking Forward

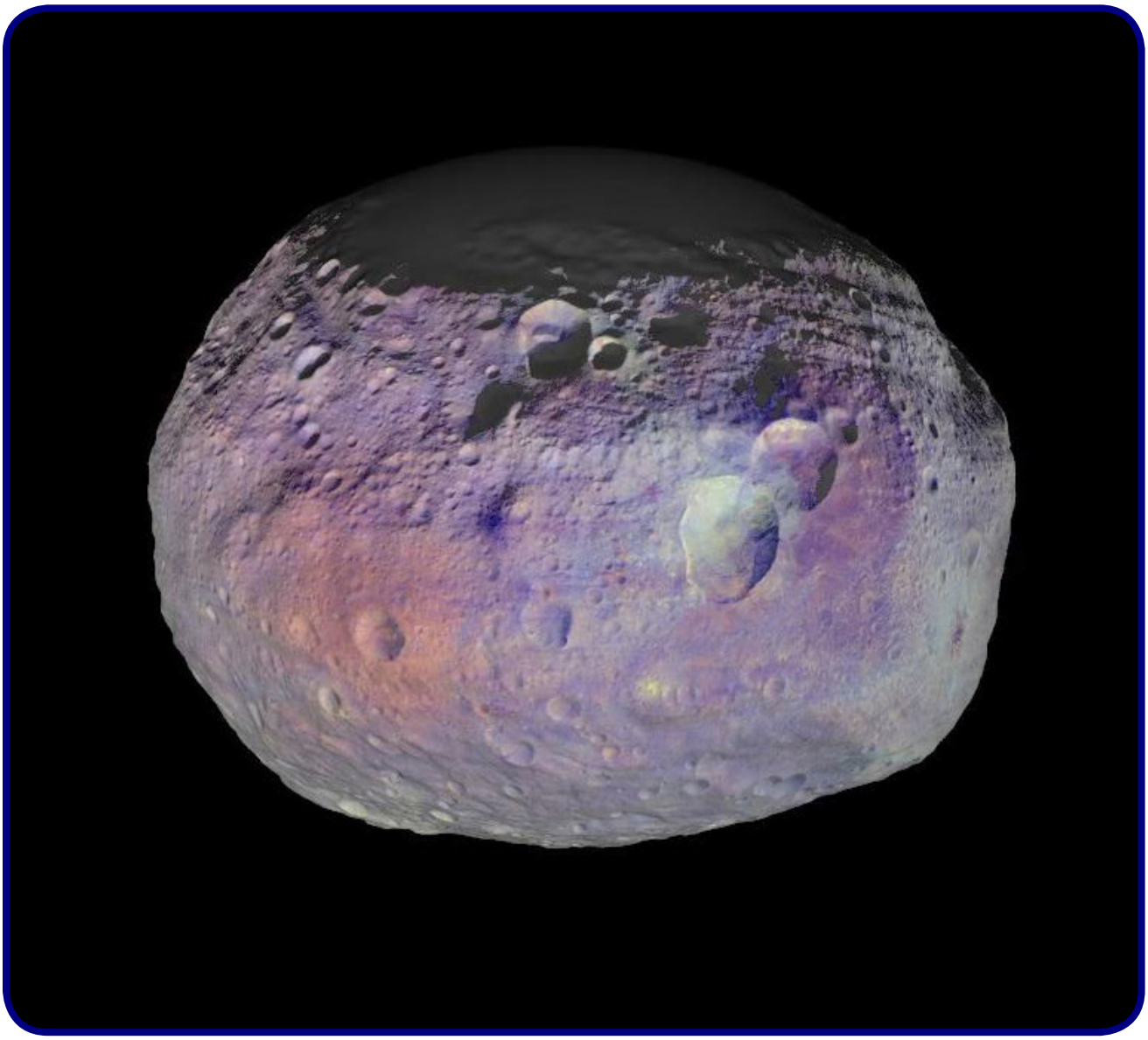


Image Caption: This picture of the asteroid Vesta is made from images taken with Dawn's framing camera. Many of the images were taken at different viewing angles to provide stereo for use in determining the topography. Other images were taken through special infrared and visible light filters in the camera. These infrared and visible light images have been combined and represented in colors that highlight the nature of the minerals on Vesta's surface. The distance to the surface of Vesta is around 420 miles (680 kilometers) on average and the images have an average resolution of about 210 feet (65 meters) per pixel. (Credit: the German Aerospace Center and the Planetary Science Institute, Tucson, Ariz.)

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Looking Forward

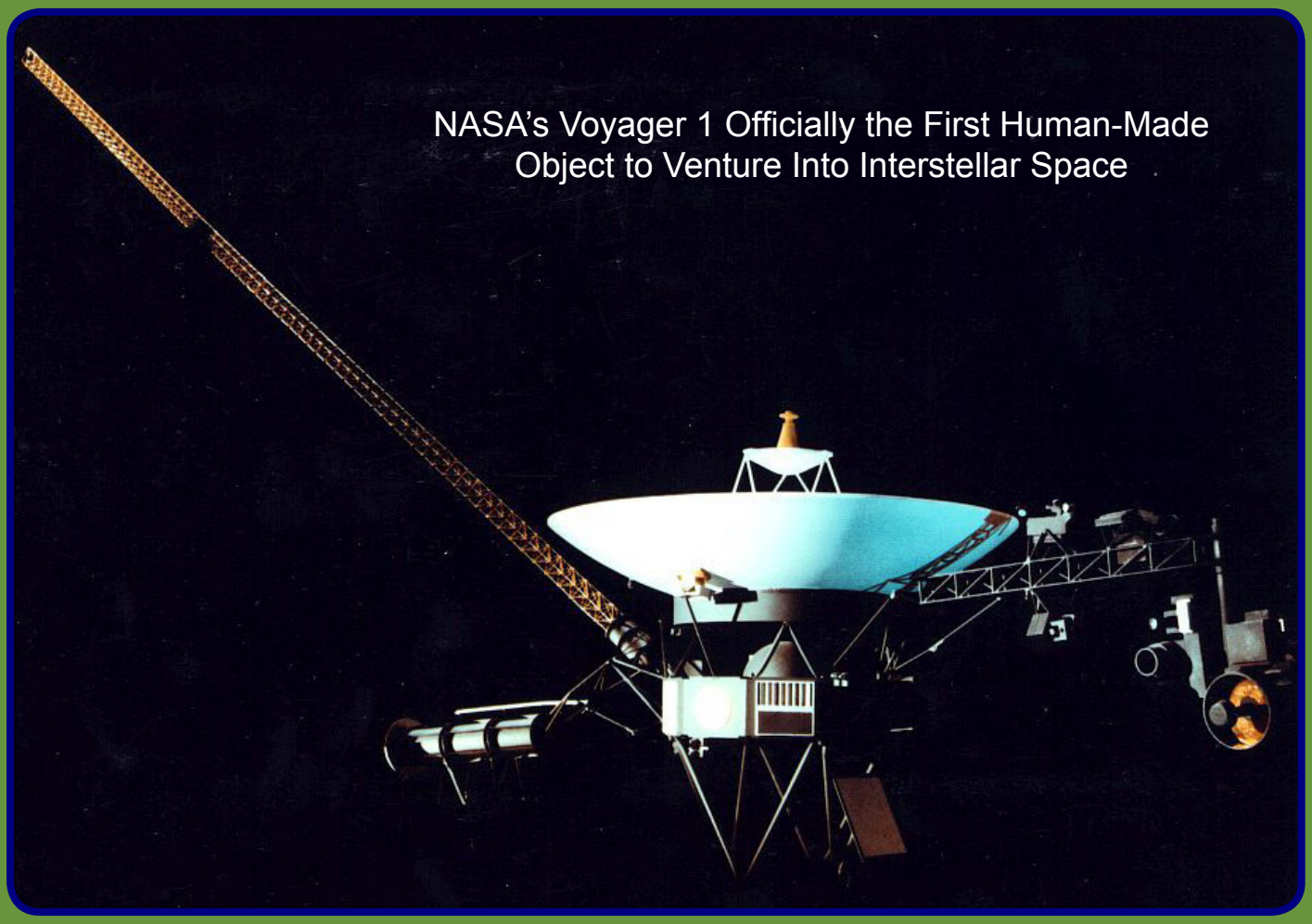
In fiscal year (FY) 2014, NASA will build on the successes achieved across FY 2013, as we continue evolving the U.S. space program. NASA and the Nation are embarking upon an ambitious exploration program that will incorporate new technologies and leverage proven capabilities, as we expand our reach out into the solar system. The multiple successes achieved by our commercial providers in FY 2013 are an example of the strong foundation being developed toward future endeavors. As the coming year unfolds, NASA will forge ahead with the important research being conducted every day aboard the International Space Station, which continues to yield scientific benefits and to provide key information about how humans may live and thrive in the harsh environment of space. Foundational to this research is the capability to bring supplies and crew to orbit, which we will enhance in FY 2014 through additional flights that deliver cargo from our growing list of capable commercial providers.

NASA will emphasize the work and contributions to the Nation that are realized from its scientific endeavors. After several years of preparation, the Magnetospheric MultiScale Mission (MMS) is expected to launch in FY 2014. This unmanned mission will utilize four spacecraft flying in a tetrahedral formation to conduct research on the Earth's magnetosphere. NASA will continue to make strides in the development of other key science missions. The Mars Atmosphere and Volatile EvolutioN Mission (MAVEN), which will launch in November 2013, will reach the orbit of our closest neighbor in October 2014. Development of the James Webb Space Telescope remains steadily on its development path, and is rapidly moving toward its completion and launch, planned in 2018. The Solar Dynamics Observatory, which launched on February 11, 2010, is expected to complete collection of its prime science measurements, and bring back key findings about the Sun's dynamic processes. In Astrophysics, the Fermi Gamma-ray Space Telescope, launched in 2008, will also finish its primary mission objectives; since the telescope's inception it has monitored more than a thousand galaxies.

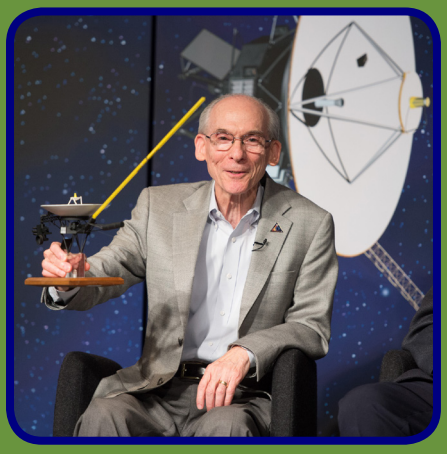
NASA expects its innovative technology development to serve the Nation by underpinning future spacecraft advancements, supporting life in space, and enabling the next generation air transportation system. In FY 2014, NASA will make progress on concept developments, small satellite missions, and technology demonstrators. As current and future work results in new capabilities, knowledge, and technologies, it is a core part of NASA's Mission to share these advances with the Nation. Through this access, entrepreneurs, industry, academia, and other government agencies are encouraged to innovate in ways that can help address national and global needs and challenges. NASA will remain committed to increasing interest in science, technology, engineering, and mathematics (STEM) education, the Nation's economic vitality, and stewardship of Earth.

This is an exciting time for NASA, a time of opportunities to shape a promising future for the Nation's space program. As a foundational component of this journey, NASA will

continue to focus on fiscal responsibility, performance management, and long term affordability, all the while addressing any management challenges or risk that may pose a roadblock to future success. NASA remains aware of the incredible challenges that lie ahead given the economic and fiscal environment in the United States. NASA will do its part to step up to these challenges through the effective, efficient, and transparent use of the resources entrusted to the Agency.



The 36-year-old probe is about 12 billion miles (19 billion kilometers) from our sun. New and unexpected data indicate Voyager 1 has been traveling for about one year through plasma, or ionized gas, present in the space between stars. A report on the analysis of this new data is published in the journal Science (online September 12, 2013). (Credit: NASA/Carla Cioffi)



Ed Stone, Voyager project scientist, California Institute of Technology, holds a model of NASA's Voyager spacecraft at a news conference at NASA Headquarters in Washington.

Suzanne Dodd, Voyager project manager, NASA's Jet Propulsion Lab holds a replica of the Golden Record carried on Voyager. It was intended to communicate a story of our world to extraterrestrials.

NASA Headquarters
Washington DC, 20546