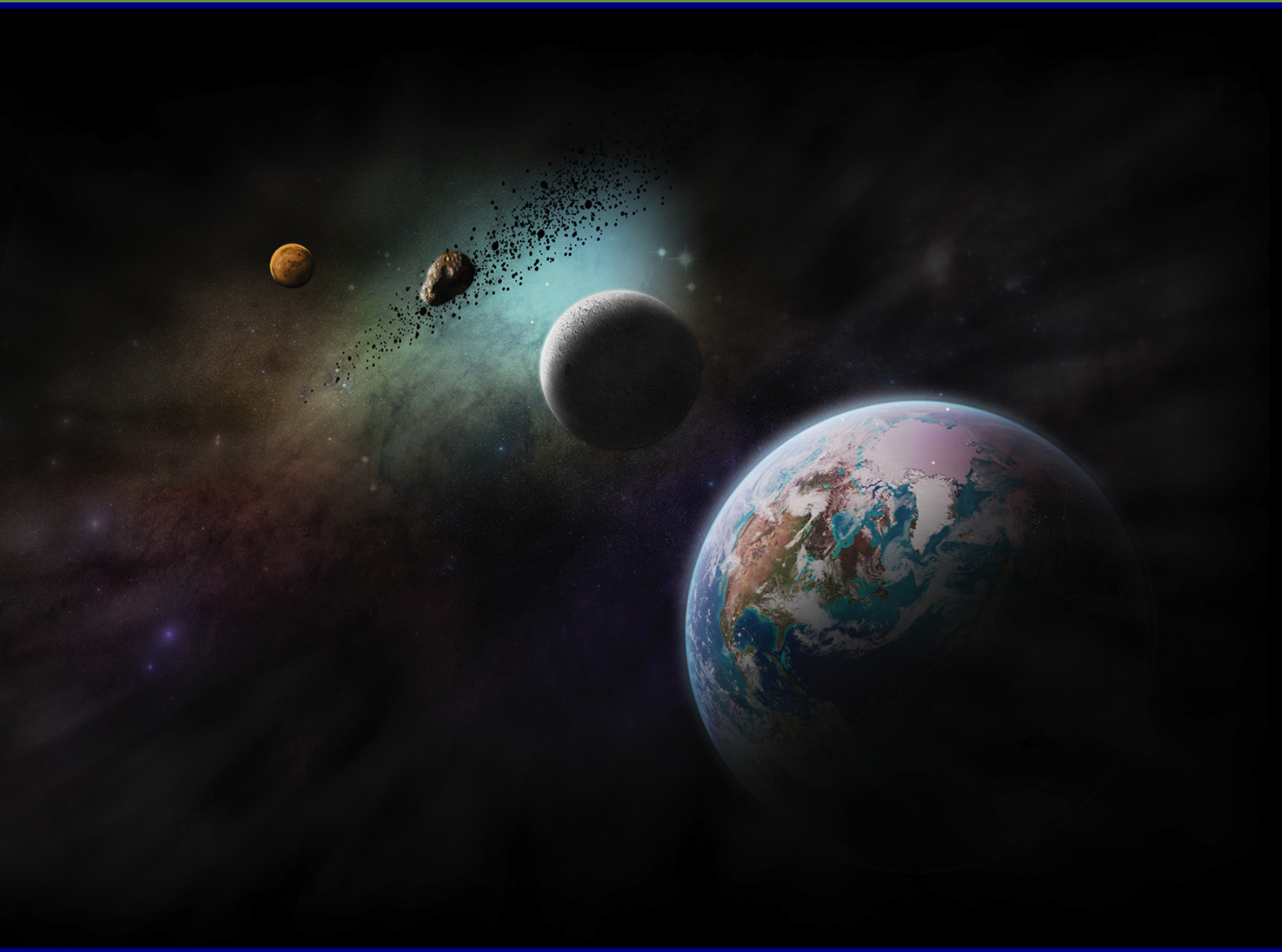
National Aeronautics and Space Administration



FY 2013 Agency Financial Report

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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 being inspected after going 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

December 6, 2013

I am proud to present the National Aeronautics and Space Administration's (NASA) Fiscal Year (FY) 2013 Agency Financial Report 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 financial statements. 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. Reports and recommendations from NASA's Inspector General and independent auditors are also included. 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 progress toward achieving our Strategic Goals, I invite you to read our Annual Performance Report, which will be released with the President's Budget Request in early 2014.

Charles F. Bolden, Jr.
Administrator

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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)

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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)

Welcome to NASA

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.

Overarching Strategies

Investing in next-generation technologies and approaches to spur innovation.

Inspiring students to be our future scientists, engineers, explorers, and educators through interactions with NASA's people, missions, research, and facilities.

Committing to environmental stewardship through Earth observation and science, and the development and use of green technologies and capabilities in NASA missions and facilities.

Expanding partnerships with international, intergovernmental, academic, industrial, and entrepreneurial communities and recognizing their role as important contributors of skill and creativity to our missions and for the propagation of our results.

Securing the public trust through transparency and accountability in our programmatic and financial management, procurement, and reporting practices.

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.

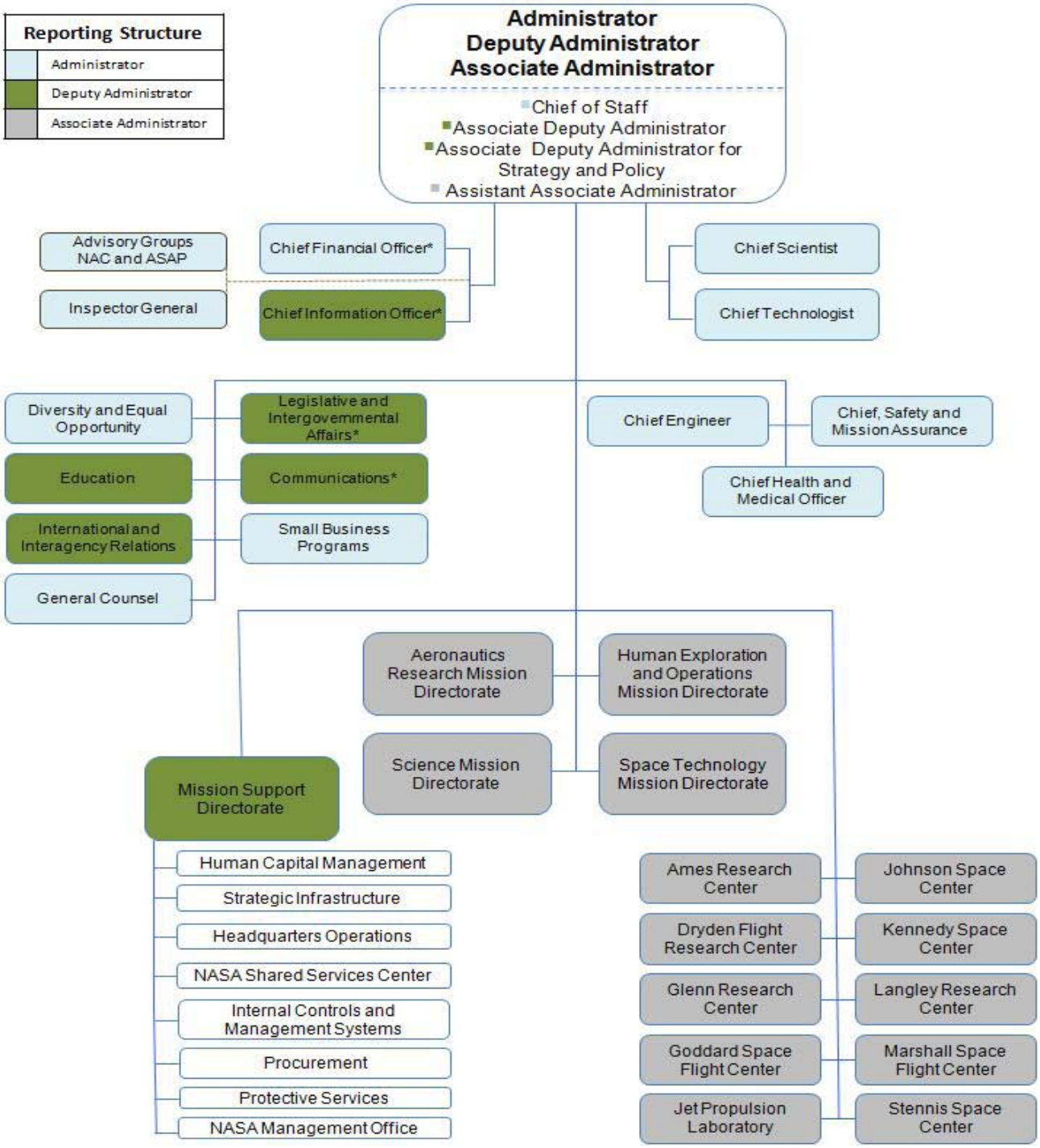
Mission Support Directorate (MSD) supports all NASA Missions in a crosscutting manner. For example, MSD manages the Cross Agency Support (CAS) and Construction and Environmental Compliance and Restoration (CECR) accounts which cut across all Mission Directorates. CAS and CECR accounts fund operations 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.

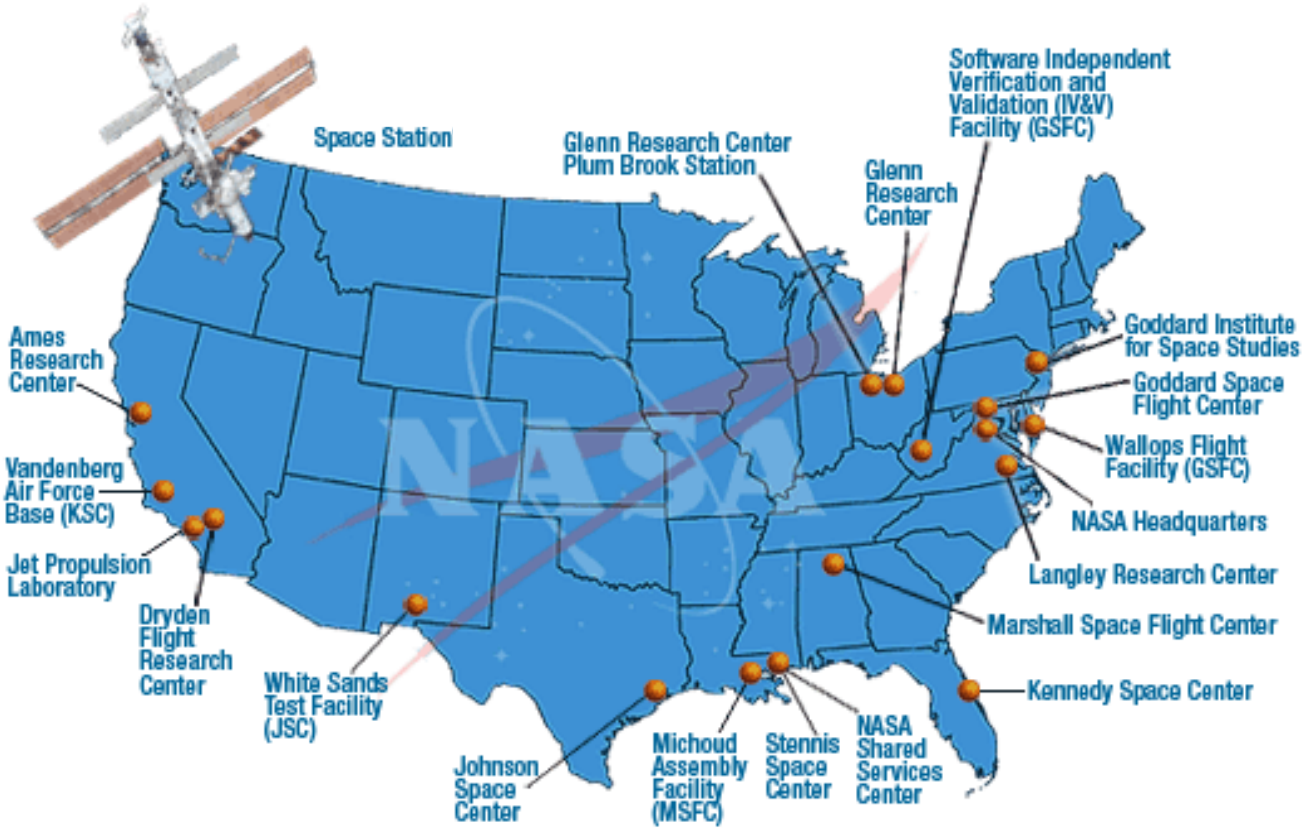
Organizational Structure



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.

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Mission Performance

Performance Overview

NASA has chosen to produce an Agency Financial Report (AFR) and Annual Performance Report (APR). NASA will include its FY 2013 APR with its Congressional Budget Justification and will post it on NASA's website at www.nasa.gov by February 2014. 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**

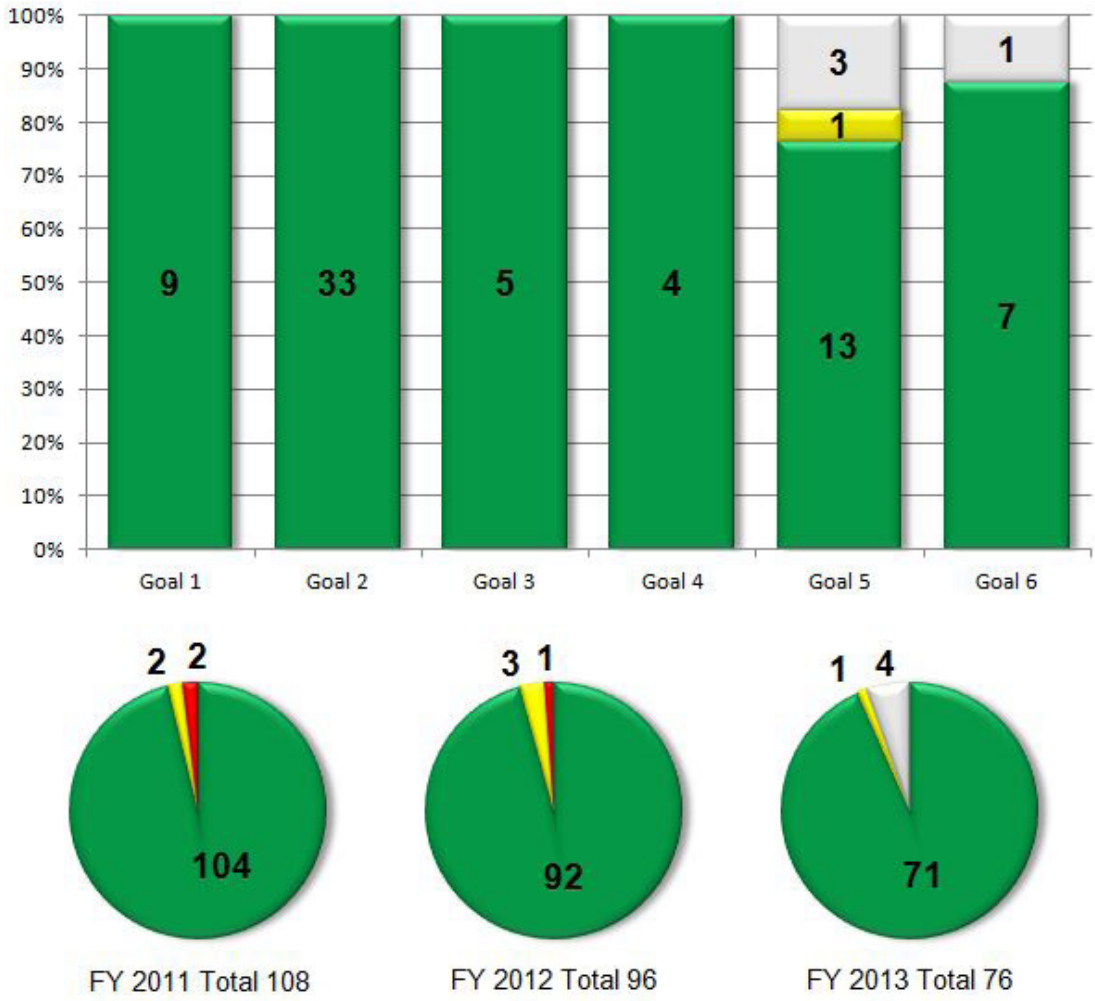
Performance Summary

In FY 2013, NASA reviewed progress toward 76 two to five year performance goals and 91 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 with APR with the President's FY 2015 Budget.

Performance Goals*

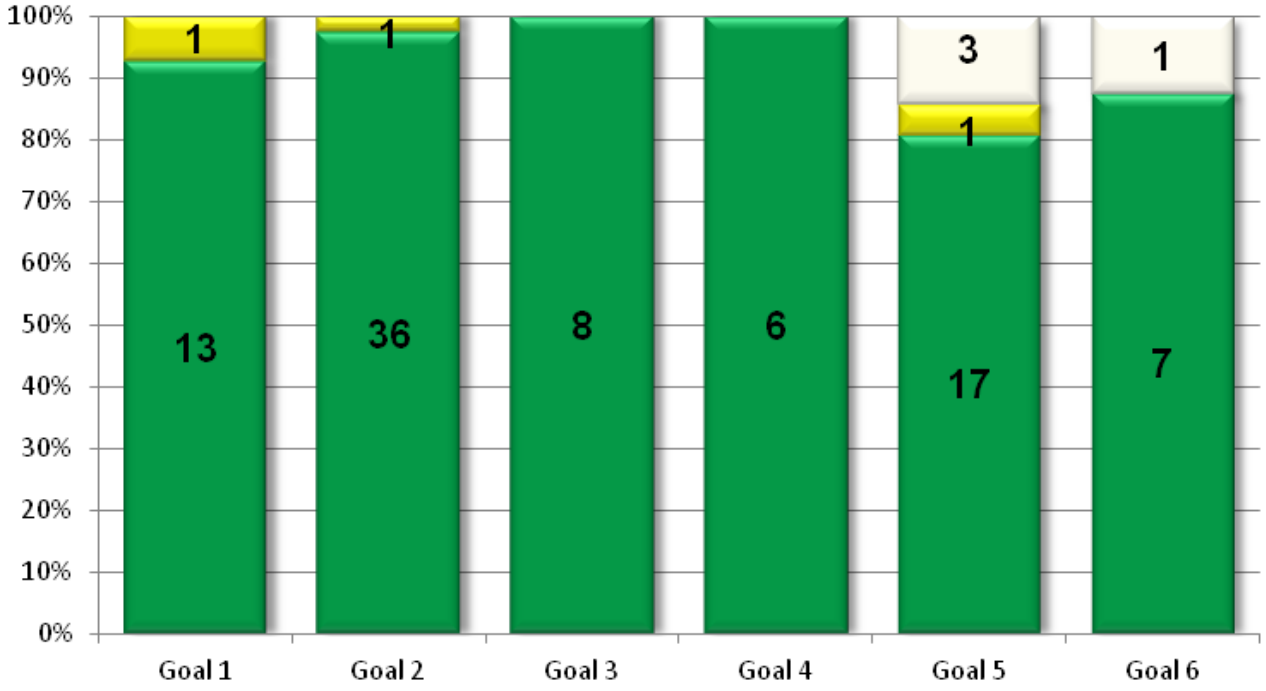
FY 2013 Performance Goal Ratings by Strategic Goal

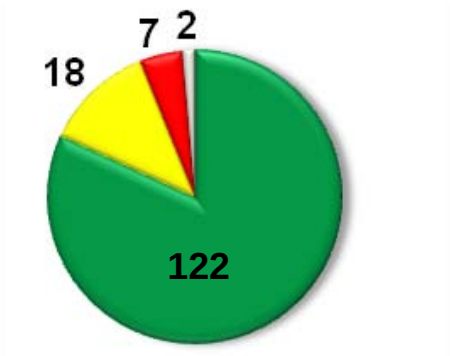


*These ratings are a high level summary of performance and reflect preliminary year-end assessment of progress. For final ratings, specific descriptions of measures, rating explanations, and performance improvement plans, refer to the Annual Performance Report within the Management and Performance Section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

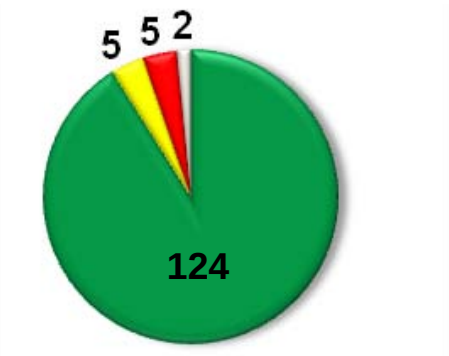
Annual Performance Indicators*

FY 2013 APIs by Strategic Goal

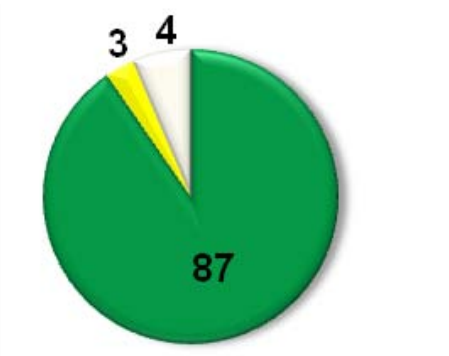




FY 2011 Total 149



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.

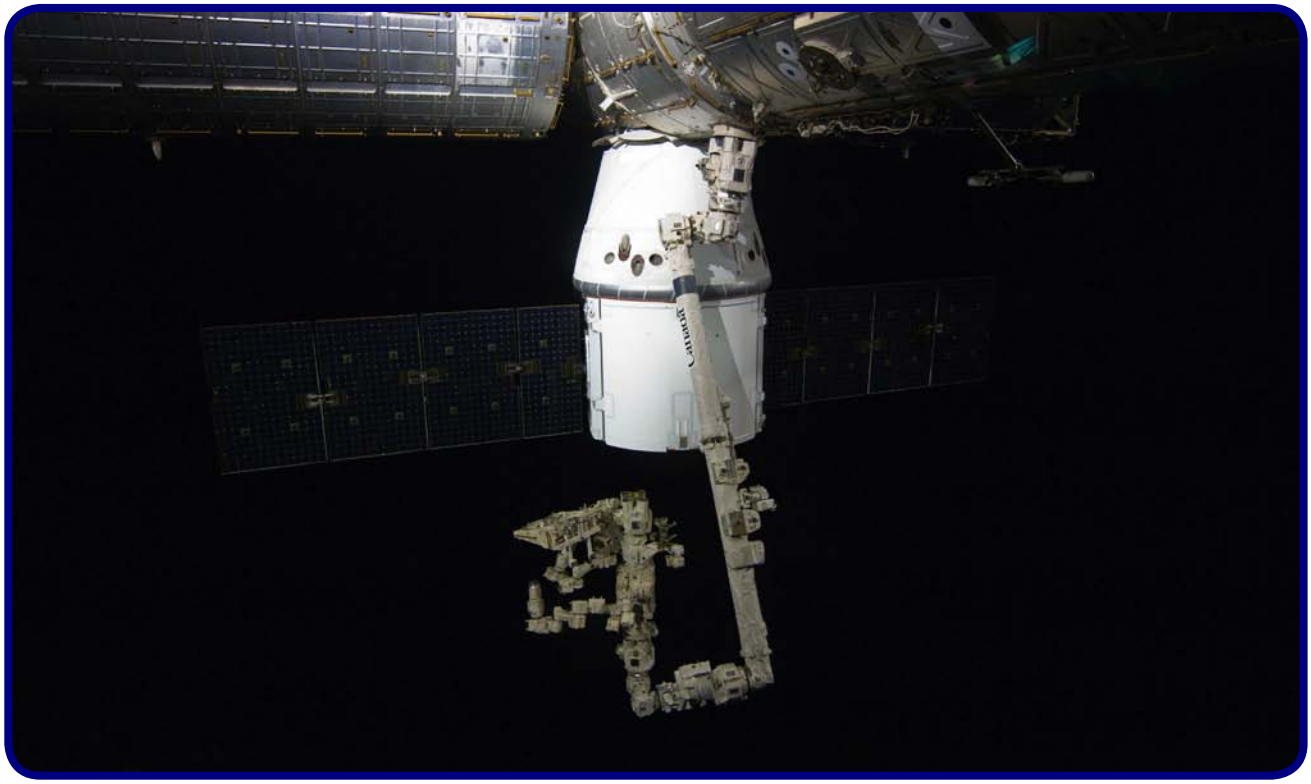

Image Caption: The SpaceX Dragon commercial cargo craft is berthed to the Earth-facing side of the International Space Station's Harmony node. Dragon became the first commercially developed space vehicle to be launched to the station to join Russian, European and Japanese resupply craft that service 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

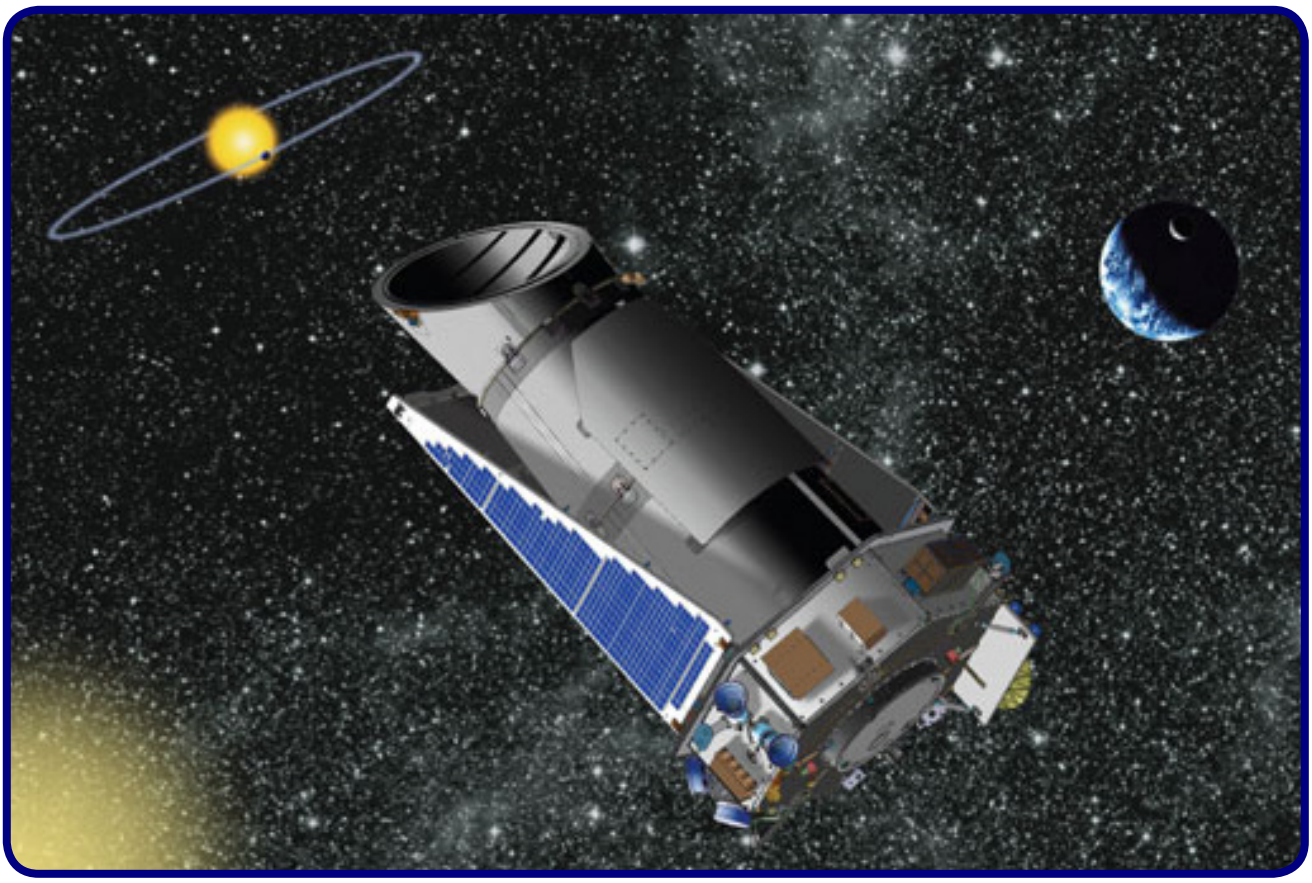

Image Caption: Kepler: NASA's first mission capable of finding Earth-size and smaller planets around other stars. The centuries-old quest for other worlds like our Earth has been rejuvenated by the intense excitement and popular interest surrounding the discovery of giant planets like Jupiter orbiting 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.

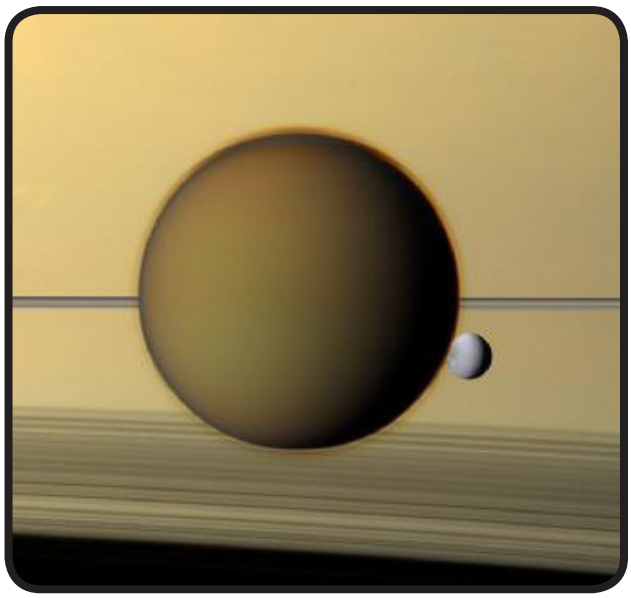

Image Caption: Saturn's third-largest moon, Dione, can be seen through the haze of its largest moon, Titan, in this view of the two posing before the planet and its rings from NASA's Cassini spacecraft. (Credit: NASA/JPL-Caltech/Space Science Institute)

- 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.

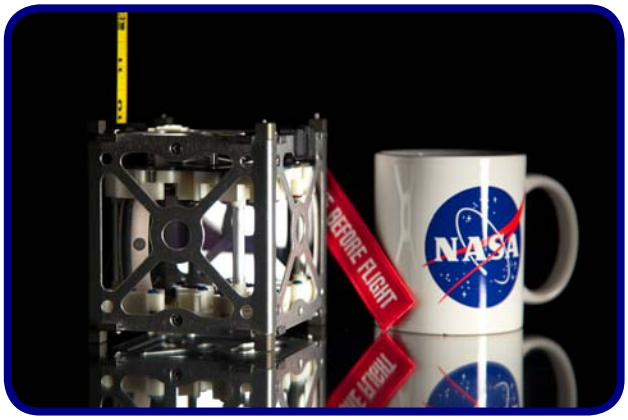

Image Caption: Roughly the size of a coffee cup, PhoneSat 1.0 is a capable satellite that leverages off-the-shelf smartphone technology. (Credit: NASA)

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

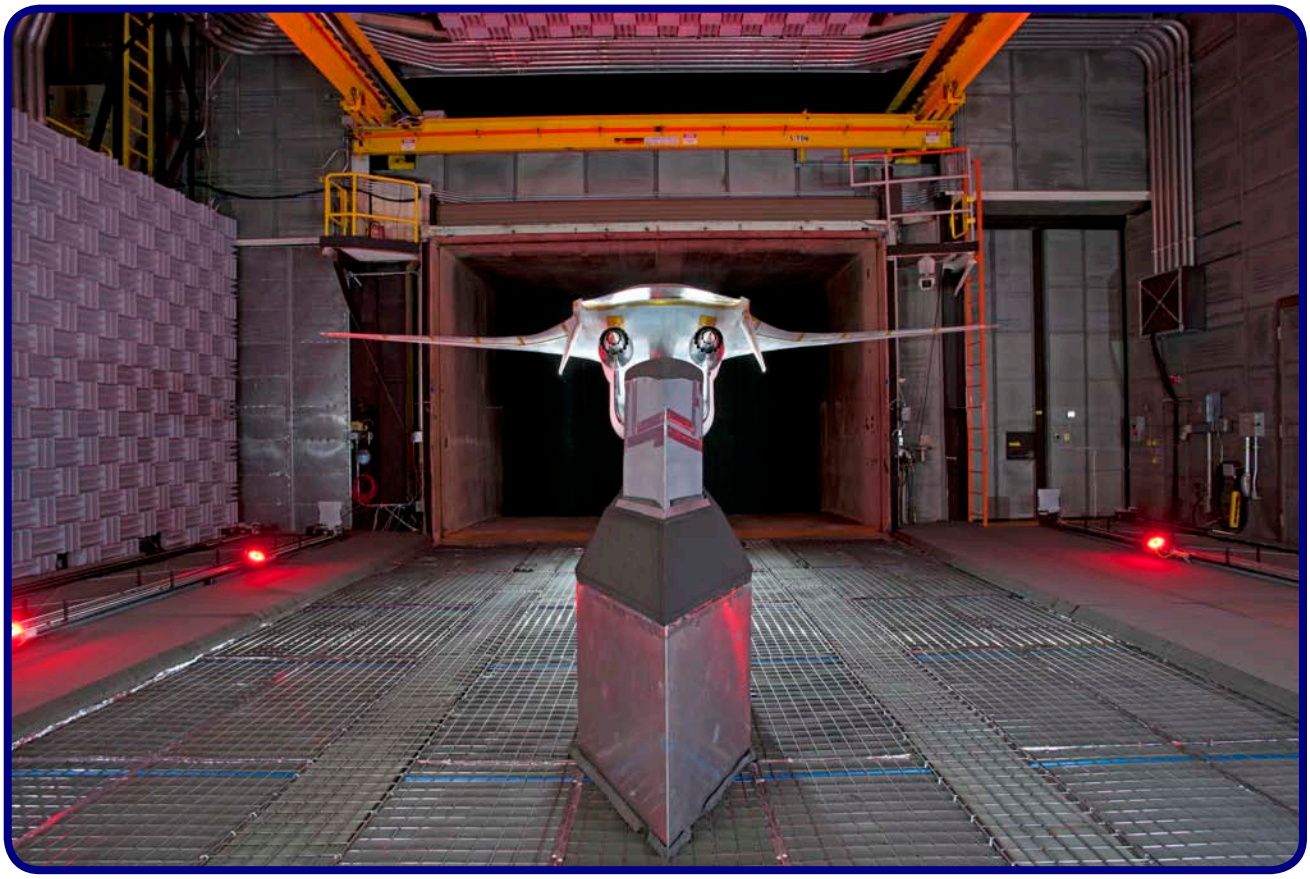

Image Caption: The Environmentally Responsible Aviation Project successfully completed testing in the Langley Research Center's 14x22-Foot Subsonic Wind Tunnel to demonstrate the noise reduction potential of the Hybrid Wing Body aircraft configuration. (Credit: NASA/Sean Smith)

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 sustaining American commerce and safe, environmentally-sustainable mobility, and hence the Nation's economic well being. 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 defining 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 project goals of 36 decibels perceived noise reduction below the FAA noise standard. 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 alter-

native fuels by successfully completing in-flight and ground-based tests in April 2013 to measure the gaseous and particulate 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 operators for improved flight efficiencies and cost savings.

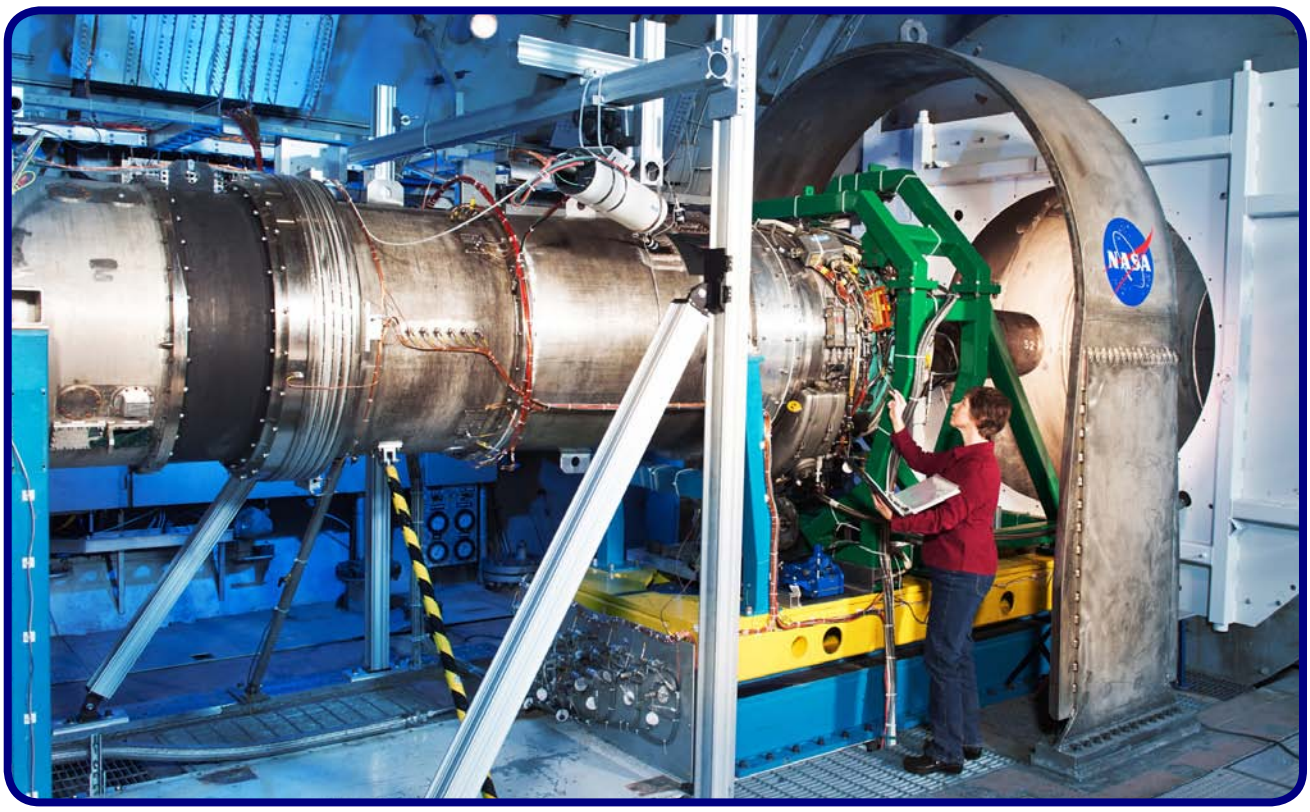

Image Caption: Judy Van Zante, NASA Glenn icing cloud specialist, was the first person to calibrate the high altitude ice crystal cloud environment necessary to cause a loss of engine power during an engine test in the PSL. (Credit: NASA)

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

December 6, 2013

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 FY 2013 Agency Financial Report (AFR) 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 FY 2013. As the complexity and diversity 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 AFR provides detailed highlights of our FY 2013 performance and more information on the intersection between NASA's program and financial management. This year NASA resolved its only remaining significant deficiency in internal controls over NASA's environmental liability estimation process. In addition, NASA was a recipient of the Association of Government Accountants' Certificate of Excellence in Accountability Reporting (CEAR) for our FY 2012 AFR. I am proud to report that NASA is in substantial compliance with the Federal Financial Management Improvement Act for FY 2013.

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 performance reporting will be available in our Annual Performance Report, to be released with the President's FY 2015 Budget.

Dr. Elizabeth 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

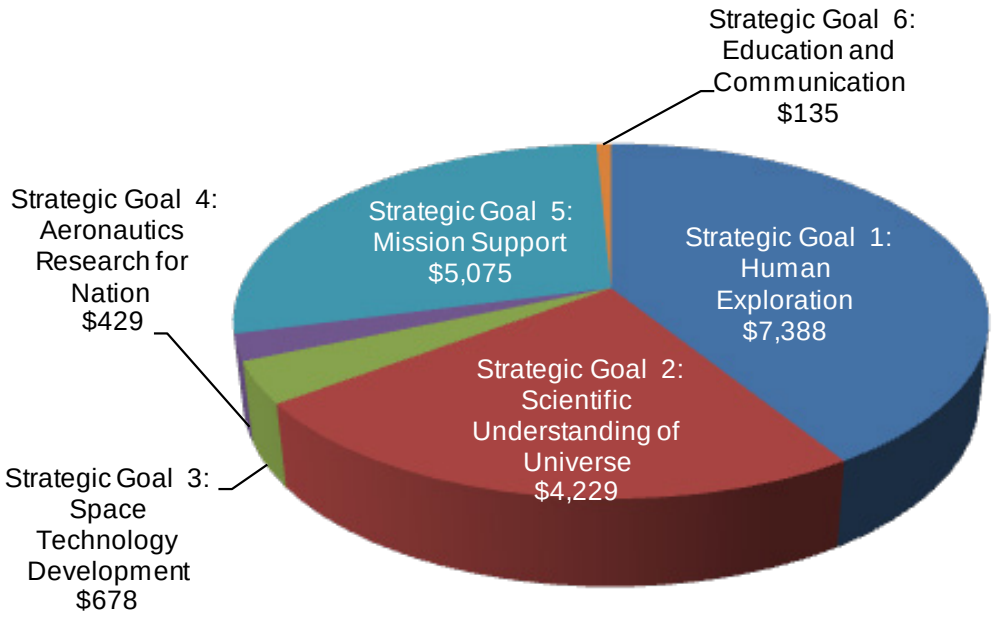
This section provides highlights of NASA's financial performance for FY 2013. The highlights explain the impacts of program and operational decisions on financial results. Key components of this section include:

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

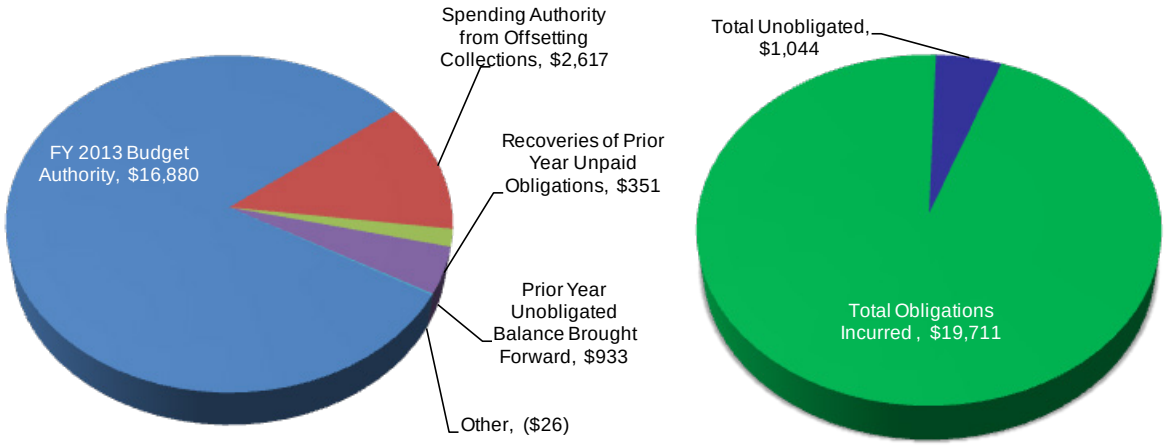
Gross Costs decreased by $25 million, or 16%, primarily as a result of NASA's efforts to realign resources to improve the effectiveness of the Agency's' Science, Technology, Engineering and Mathematics (STEM) projects. In FY 2013, the STEM Education and Accountability program consolidated the K-12 STEM 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.

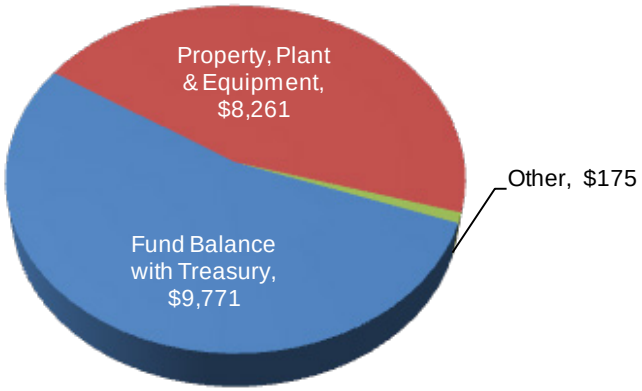
Other of ($26) million represents the amount of expired obligated and unobligated appropriation balances that are canceled as of September 30, 2013. There was no appreciable change in the amount of Other from FY 2012 to FY 2013.

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.

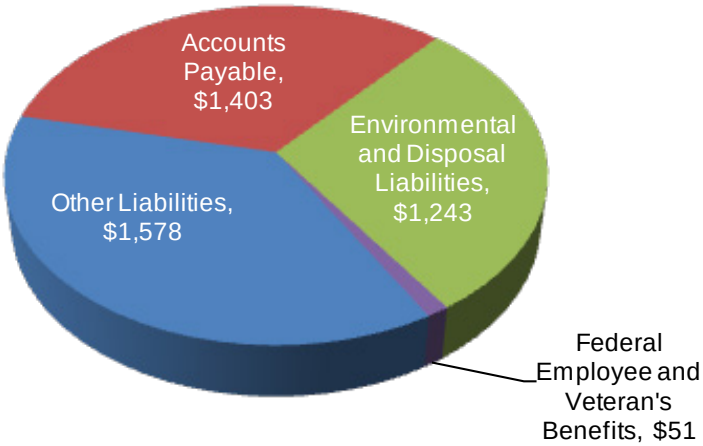
Property, Plant and Equipment (PP&E), the next largest category of assets, decreased by $645 million, or 7%, from FY 2012 to FY 2013. The primary contributing factor in the decrease in PP&E was an increase in accumulated depreciation associated with the International Space Station.

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.

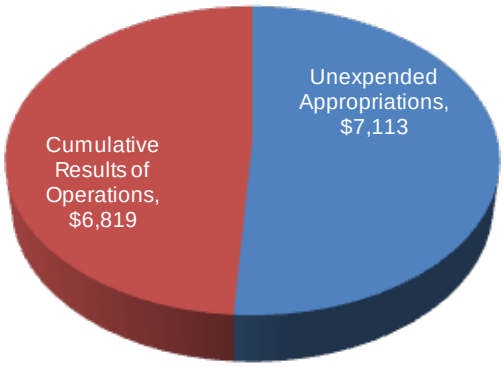
Environmental and Disposal Liabilities increased by $74 million, or 6%, from FY 2012 to FY 2013. The change was primarily due to an increase in estimated restoration project costs and asbestos clean-up costs, which is a new reporting requirement for FY 2013.

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

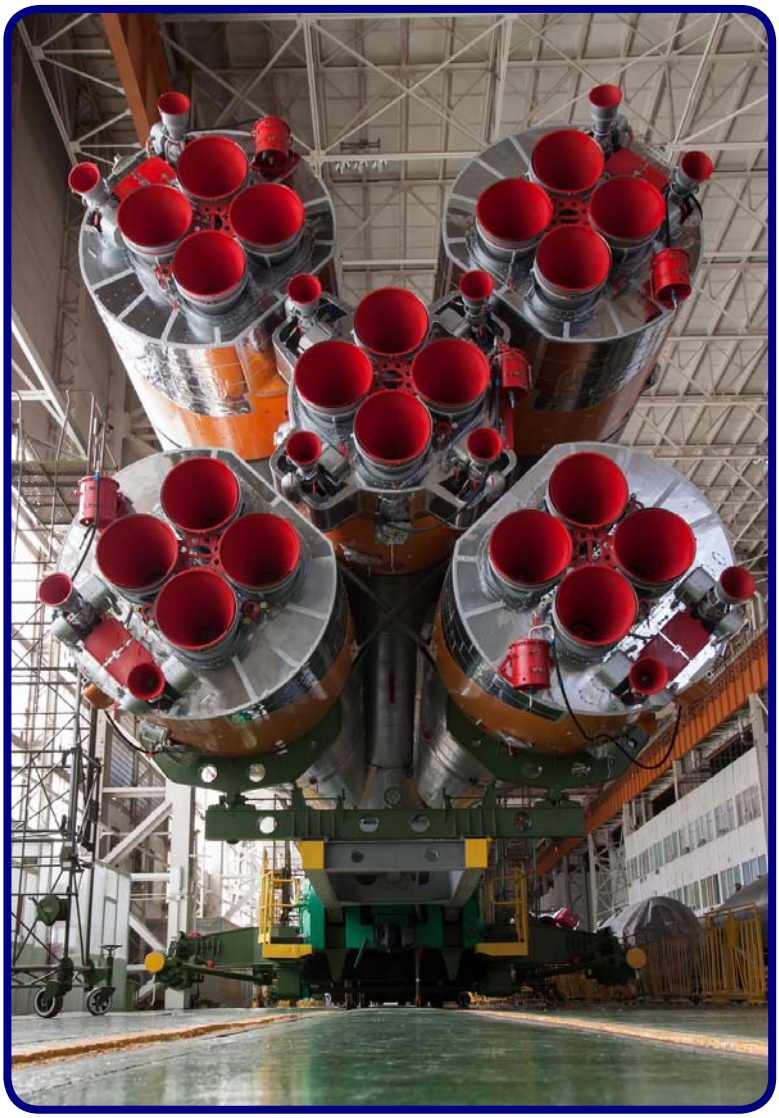

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Image Caption: The base of the Soyuz solid rocket boosters are seen at Building 112 on the Baikonur Cosmodrome, in Baikonur, Kazakhstan. The Soyuz rocket carried Expedition 37 Soyuz Commander Oleg Kotov, NASA Flight Engineer Michael Hopkins, and Russian 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

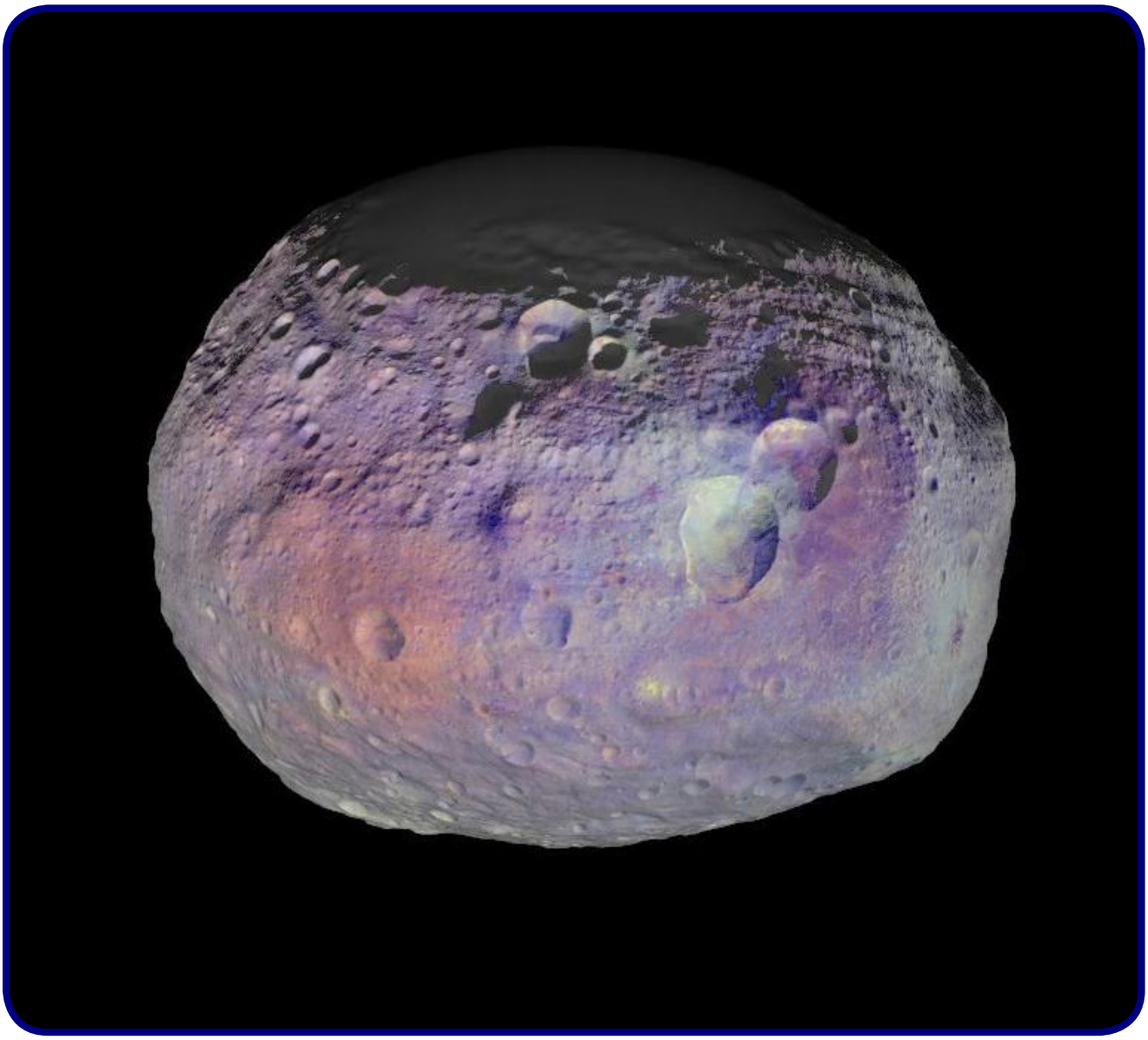

Image Caption: This picture of the asteroid Vesta is made from images taken with Dawn's framing camera. Many of the images were taken at different viewing angles to provide stereo for use in determining the topography. Other images were taken through special infrared and visible light filters in the 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.

Financials

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Image Caption: NASA's Lunar Atmosphere and Dust Environment Explorer (LADEE, pronounced like "lad-die") is a robotic mission that is orbiting the moon to gather detailed information about the lunar atmosphere, conditions near the surface and environmental influences on lunar dust. A thorough understanding of these characteristics will address long-standing unknowns, and help scientists understand other planetary bodies as well. (Credit: NASA)

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Introduction to the Principal Financial Statements

The principal financial statements are prepared to report the financial position and results of operations of the National Aeronautics and Space Administration (NASA), pursuant to the requirements of 31 U.S.C. 3515 (b). The statements are prepared from the records of NASA in accordance with generally accepted accounting principles (GAAP) and the formats prescribed by the Office of Management and Budget (OMB) in Circular No. A-136, *Financial Reporting Requirements*. The statements are in addition to financial reports prepared by NASA in accordance with OMB and U.S. Department of the Treasury (Treasury) directives to monitor and control the status and use of budgetary resources, which are prepared from the same records. The statements should be read with the understanding that they are for a component of the U.S. Government, a sovereign entity. One important implication of this is that NASA has no authority to pay liabilities not covered by budgetary resources. Liquidation of such liabilities requires enactment of an appropriation. Comparative data for FY 2012 is included where applicable. The principal financial statements, which include the following, are the responsibility of management:

- **Consolidated Balance Sheet** provides information on assets, liabilities, and net position as of the end of the reporting period. Net position is the difference between assets and liabilities. It is a summary measure of the Agency's financial condition at the end of the reporting period.

- **Consolidated Statement of Net Cost** reports net cost of operation during the reporting periods by strategic goal and at the entity level. It is a measure of gross cost of operations less earned revenue, and represents cost to taxpayers for achieving each strategic goal and Agency mission at the entity level.

- **Consolidated Statement of Changes in Net Position** reports the beginning balance of net position, current financing sources and use of resources, unexpended resources (transactions that affect net position) for the reporting period, and ending net position for the current period.

- **Combined Statement of Budgetary Resources** reports information on sources and status of budgetary resources for the reporting period. Information in this statement is reported on the budgetary basis of accounting which supports compliance with budgetary controls and controlling legislation.

- **Required Supplementary Stewardship Information** provides information on NASA's Research and Development costs by strategic goal.

- **Required Supplementary Information** contains a Combining Statement of Budgetary Resources and information on Deferred Maintenance.

Financial Statements, Notes, and Supplemental Information

National Aeronautics and Space Administration
Consolidated Balance Sheet
As of September 30, 2013 and 2012
(In Millions of Dollars)

	Audited 2013	Audited 2012
Assets (Note 2):		
Intragovernmental:		
Fund Balance with Treasury (Note 3)	$ 9,771	$ 9,901
Investments (Note 4)	17	17
Accounts Receivable (Note 5)	156	208
Total Intragovernmental	9,944	10,126
Accounts Receivable, Net (Note 5)	2	1
Property, Plant and Equipment, Net (Note 6)	8,261	8,906
Other Assets (Note 8)	—	2
Total Assets	**$ 18,207**	**$ 19,035**
Stewardship PP&E (Note 7)		
Liabilities (Note 9):		
Intragovernmental:		
Accounts Payable	$ 89	$ 75
Other Liabilities (Note 11)	92	85
Total Intragovernmental	181	160
Accounts Payable	1,314	1,384
Federal Employee and Veteran Benefits	51	50
Environmental and Disposal Liabilities (Note 10)	1,243	1,169
Other Liabilities (Note 11)	1,486	1,522
Total Liabilities	**4,275**	**4,285**
Commitments and Contingencies (Note 12)		
Net Position:		
Unexpended Appropriations	7,113	7,234
Cumulative Results of Operations	6,819	7,516
Total Net Position	**13,932**	**14,750**
Total Liabilities and Net Position	**$ 18,207**	**$ 19,035**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Consolidated Statement of Net Cost
For the Fiscal Years Ended September 30, 2013 and 2012
(In Millions of Dollars)

	Audited 2013	Audited 2012
Cost by Strategic Goal (Note 13)		
Strategic Goal 1 – Human Exploration		
Gross Costs	$ 7,662	$ 8,129
Less: Earned Revenue	274	331
Net Costs	7,388	7,798
Strategic Goal 2 – Scientific Understanding of Universe		
Gross Costs	$ 5,790	$ 5,543
Less: Earned Revenue	1,561	1,349
Net Costs	4,229	4,194
Strategic Goal 3 – Space Technology Development		
Gross Costs	$ 678	$ 291
Less: Earned Revenue	—	—
Net Costs	678	291
Strategic Goal 4 – Aeronautics Research for Nation		
Gross Costs	$ 524	$ 550
Less: Earned Revenue	95	104
Net Costs	429	446
Strategic Goal 5 – Mission Support		
Gross Costs	$ 5,430	$ 5,356
Less: Earned Revenue	355	290
Net Costs	5,075	5,066
Strategic Goal 6 – Education and Communication		
Gross Costs	$ 135	$ 160
Less: Earned Revenue	—	—
Net Costs	135	160
Net Cost of Operations		
Total Gross Costs	$ 20,219	$ 20,029
Less: Total Earned Revenue	2,285	2,074
Net Cost	**$ 17,934**	**$ 17,955**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Consolidated Statement of Changes in Net Position
For the Fiscal Years Ended September 30, 2013 and 2012
(In Millions of Dollars)

	Audited 2013	Audited 2012
Cumulative Results Of Operations:		
Beginning Balances	$ 7,516	$ 8,165
Budgetary Financing Sources:		
Appropriations Used	16,974	17,027
Nonexchange Revenue	14	2
Other Financing Sources:		
Donations and Forfeitures of Property	3	4
Transfers In/Out Without Reimbursement	109	100
Imputed Financing	150	176
Other	(13)	(3)
Total Financing Sources	17,237	17,306
Net Cost of Operations	(17,934)	(17,955)
Net Change	(697)	(649)
Cumulative Results of Operations	**6,819**	**7,516**
Unexpended Appropriations:		
Beginning Balance	7,234	6,528
Budgetary Financing Sources:		
Appropriations Received	17,877	17,800
Other Adjustments	(1,024)	(67)
Appropriations Used	(16,974)	(17,027)
Total Budgetary Financing Sources	(121)	706
Unexpended Appropriations	**7,113**	**7,234**
Net Position	**$ 13,932**	**$ 14,750**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Combined Statement of Budgetary Resources
For the Fiscal Years Ended September 30, 2013 and 2012
(In Millions of Dollars)

	Audited 2013	Audited 2012
Budgetary Resources:		
Unobligated Balance, Brought Forward, October 1	$ 933	$ 677
Recoveries of Prior Year Unpaid Obligations	351	365
Other Changes in Unobligated Balance	(26)	(37)
Unobligated Balance from Prior Year Budget Authority, Net	1,258	1,005
Appropriations	16,880	17,771
Spending Authority from Offsetting Collections	2,617	2,842
Total Budgetary Resources	**$20,755**	**$21,618**
Status of Budgetary Resources:		
Obligations Incurred (Note 14)	$ 19,711	$ 20,685
Unobligated Balance, End of Year:		
Apportioned	903	821
Unapportioned	141	112
Total Unobligated Balance, End of Year	1,044	933
Total Status of Budgetary Resources	**$ 20,755**	**$ 21,618**
Change in Obligated Balance:		
Unpaid Obligations:		
Unpaid Obligations Brought Forward, October 1	$ 10,284	$ 9,526
Obligations Incurred (Note 14)	19,711	20,685
Outlays (Gross) (-)	(19,873)	(19,562)
Recoveries of Prior Year Unpaid Obligations (-)	(351)	(365)
Unpaid Obligations, End of Year	9,771	10,284
Uncollected Payments:		
Uncollected Payments, Federal Sources, Brought Forward, October 1 (-)	(1,318)	(851)
Change in Uncollected Payments, Federal Sources	267	(467)
Uncollected Customer Payments from Federal Sources, End of Year (-)	(1,051)	(1,318)
Memorandum (Non-Add) Entries		
Obligated Balance, Start of Year	**8,966**	**8,675**
Obligated Balance, End of Year	**$ 8,720**	**$ 8,966**
Budget Authority and Outlays, Net:		
Budget Authority, Gross	$19,497	$20,613
Actual Offsetting Collections (-)	(2,884)	(2,375)
Change in Uncollected Customer Payments from Federal Sources	267	(467)
Budget Authority, Net	**$ 16,880**	**$ 17,771**
Outlays, Gross	$19,873	$19,562
Actual Offsetting Collections (-)	(2,884)	(2,375)
Outlays, Net	16,989	17,187
Distributed Offsetting Receipts (-)	(13)	3
Agency Outlays, Net	**$ 16,976**	**$ 17,190**

The accompanying notes are an integral part of this statement.

Note 1: Summary of Significant Accounting Policies

Reporting Entity

The National Aeronautics and Space Administration (NASA) is an independent agency established by Congress on October 1, 1958 by the National Aeronautics and Space Act of 1958. NASA was incorporated from its predecessor agency, the National Advisory Committee for Aeronautics, which provided technical advice to the United States (U.S.) aviation industry and performed aeronautics research. Today, NASA serves as the principal Agency of the United States government for initiatives in civil space and aviation.

NASA is organized into four Mission Directorates supported by one Missions Support Directorate (see Organization at page 7):

- Aeronautics Research: conducts research which enhances aircraft performance, environmental compatibility, capacity, flexibility, and safety of the future air transportation system;
- Human Exploration and Operations: develops new capabilities, supporting technologies and foundational research for affordable, sustainable human and robotic exploration;
- Science: explores the Earth, Moon, Mars, and beyond; charts the best route of discovery, and obtains the benefits of Earth and space exploration for society; and
- Space Technology: develops new technologies needed to support current and future NASA missions, other agencies and the aerospace industry.

The Agency's administrative structure includes the Strategic Management Council, Mission Support Council, Program Management Council, and other Committees to integrate strategic, tactical, and operational decisions in support of strategic focus and direction.

Operationally, NASA is organized into nine Centers across the country, a Headquarters Office, a NASA Shared Services Center, and the Jet Propulsion Laboratory (JPL). JPL is a federally funded research and development center (FFRDC), operated for NASA by a contractor, Caltech, staffed by Caltech employees in NASA-owned facilities, similar to other contractors that use NASA-owned contractor-held assets.

The accompanying financial statements include the accounts of all funds which have been established and maintained to account for the resources under the control of NASA management.

Basis of Accounting and Presentation

These consolidated financial statements are prepared in accordance with the U.S. generally accepted accounting principles (GAAP) and Federal Accounting Standards Advisory Board (FASAB) standards in the format prescribed by the Office of Management and Budget (OMB) Circular No. A-136, *Financial Reporting Requirements, Revised (October 2013)*. FASAB authority to set Federal government accounting standards is recognized by the American Institute of Certified Public Accountants (AICPA). The financial statements present the financial position, net cost of operations, changes in net position, and budgetary resources of NASA, as required by the Chief Financial Officers Act of 1990,

Public Law (P.L.) 101-576, and the Government Management Reform Act (P.L. 101-356).

The financial statements should be read with the realization that they are for a component of the U.S. government, a sovereign entity. One important implication of this is that liabilities cannot be liquidated without legislation providing resources and legal authority to do so. The accounting structure of federal agencies is designed to reflect proprietary and budgetary accounting. Proprietary accounting uses the accrual method of accounting. Under the accrual method of accounting, revenues are recognized when earned and expenses are recognized when incurred, without regard to the timing of receipt or payment of cash. Budgetary accounting does not use the accrual method of accounting; it accounts for the sources and status of funds to facilitate compliance with legal controls over the use of federal funds. Beginning in FY 2013, the Statement of Net Cost is presented by strategic goal, which is a change from past practice of presentation by Research and Development initiatives.

Budgets and Budgetary Accounting

NASA complies with federal budgetary accounting guidelines of OMB Circular No. A-11, *Preparation, Submission and Execution of the Budget.* Congress funds NASA's operations through nine main appropriations: Science, Aeronautics, Exploration, Space Operations, Education, Cross-Agency Support, Space Technology, Inspector General, and Construction and Environmental Compliance and Restoration. Reimbursements received under reimbursable service agreements cover the cost of goods and services NASA provides to other federal entities or non-federal entities and are recorded as Spending Authority from Offsetting Collections on the Combined Statement of Budgetary Resources.

Research and Development (R&D), Other Initiatives and Similar Costs

NASA makes substantial R&D investments for the benefit of the United States. The R&D programs include activities to extend our knowledge of Earth, its space environment, and the universe; and to invest in new aeronautics and advanced space transportation technologies supporting the development and application of technologies. Following guidance outlined in the FASAB Technical Release No. 7, *Clarification of Standards Relating to the National Aeronautics and Space Administration's Space Exploration Equipment*, NASA applies the Financial Accounting Standards Board's (FASB) Accounting Standards Codification (ASC) 730-10-25, *Research and Development - Recognition*, and FASB ASC 730-10-50 *Research and Development - Disclosure*, to its R&D projects.

Use of Estimates

The preparation of financial statements requires management to make assumptions and reasonable estimates affecting the reported amounts of assets and liabilities and disclosures of contingent liabilities as of the date of the financial statements and the reported amounts of revenues and expenses for the reporting period. Accordingly, actual results may differ from those estimates.

Fund Balance with Treasury

The U.S. Department of the Treasury (Treasury) collects and disburses cash on behalf of federal agencies during the fiscal year. The collections include funds appropriated by Congress to fund the Agency's operations

and revenues earned for services provided to other federal agencies or the public. The disbursements are for goods and services received in support of its operations and other liabilities. Fund Balance with Treasury (FBWT) is the balance of cash NASA has in its cash account with the Treasury. NASA's FBWT is comprised of balances in general funds, trust funds, working capital funds, and other types of funds.

Investments in U.S. Government Securities

NASA investments include the following Intragovernmental non-marketable securities:

(1) The Endeavor Teacher Fellowship Trust Fund (Endeavor Trust Fund) was established from public donations in tribute to the crew of the Space Shuttle Challenger. The Endeavor Trust Fund bi-annual interest earned is re-invested in short-term bills. P.L. 102-195 requires the interest earned from the Endeavor Trust Fund investments be used to create the Endeavor Teacher Fellowship Program.

(2) The Science, Space and Technology Education Trust Fund (Challenger Trust Fund) was established to advance science and technology education. The Challenger Trust Fund balance is invested in short-term bills and long-term bonds. P.L. 100-404 requires that a quarterly payment of $250,000 be sent to the Challenger Center from interest earned on the Challenger Trust Fund investments. In order to meet the requirement of providing funds to the Challenger Center, NASA invests the bi-annual interest earned in short-term bills with maturity that coincides with quarterly payments of $250,000 to beneficiaries. Interest received in excess of amount needed for quarterly payment to beneficiaries is invested in long-term bonds.

Accounts Receivable

Most of NASA's accounts receivable is for intragovernmental reimbursements for cost of goods and services provided to other federal agencies; the rest is for debts to NASA by non-federal government entities. Allowances for doubtful non-federal accounts receivable are based on factors such as: aging of accounts receivable, debtors' ability to pay, payment history, and other relevant factors. Doubtful non-federal accounts receivable over 180 days are referred to Treasury for collection, wage garnishment or cross-servicing in accordance with the federal Debt Collection Improvement Act.

Operating Materials and Supplies

NASA does not maintain inventory stock for resale. It follows the Purchases method of accounting for operating materials and supplies under which it expenses operating materials and supplies when purchased, not when used.

Property, Plant and Equipment

NASA reports depreciation expense using the straight-line method over an asset's estimated useful life, beginning with the month the asset is placed in service. Property, plant and equipment (PP&E) with acquisition costs of $100,000 or more, a useful life of 2 years or more, and R&D assets that are determined at the time of acquisition to have alternative future use, are capitalized. PP&E and R&D assets that do not meet these capitalization criteria are expensed. Capitalized costs include costs incurred by NASA to bring the property to a form and location suitable for its intended use. Certain NASA assets are held by government contractors. Under provisions of the Federal Acquisition Regulation (FAR), the contractors are re-

sponsible for the control and accountability of the assets in their possession. These government-owned, contractor-held assets are included within the balances reported in NASA's financial statements.

NASA has barter agreements with international entities; the assets and services received under these barter agreements are unique, with limited easement to only a few countries, as these assets are on the International Space Station (ISS). The intergovernmental agreements state that the parties will seek to minimize the exchange of funds in the cooperative program, including the use of barters to provide goods and services. As of September 30, 2013, NASA has received some assets from these parties in exchange for future services. The fair value is indeterminable; therefore, no value was ascribed to these transactions in accordance with FASB ASC 845-10-25 *Non-Monetary Transactions – Recognition* and ASC 845-10-50 *Non-Monetary Transactions – Disclosure*. The amounts reflected in NASA's financial reports for the ISS exclude components of the ISS owned or provided by other participants in the ISS.

Statement of Federal Financial Accounting Standards (SFFAS) No. 10, *Accounting for Internal Use Software* requires the capitalization of internally developed, contractor developed, and commercial off-the-shelf-software. Capitalized costs for internally developed software include the full costs (direct and indirect) incurred during the software development stage only. For purchased software, capitalized costs include amounts paid to vendors for the software and other material costs, incurred by NASA to implement and make the software ready for use through acceptance testing. When NASA purchases software as part of a package of products and services (for example: training, maintenance, data conversion, reengineering, site licenses, and rights to future upgrades and enhancements), capitalized and non-capitalized costs of the package are allocated among individual elements on the basis of a reasonable estimate of their relative fair market values. Costs not susceptible to allocation between maintenance and relatively minor enhancements are expensed. Software in progress of being developed is not amortized until placed in service. NASA capitalizes costs for internal use software when the total projected cost is $1 million or more and the expected useful life of the software is 5 years or more.

Liabilities Covered by Budgetary Resources

As a component of a sovereign entity, NASA cannot pay for liabilities unless authorized by law and covered by budgetary resources. Liabilities covered by budgetary resources are those for which appropriated funds are available as of the balance sheet date. Examples of covered liabilities include accounts payable and employees' salaries. Budgetary resources include unobligated balances of budgetary resources at the beginning of the year, new budget authority, and spending authority from offsetting collections.

Liabilities and Contingencies Not Covered by Budgetary Resources

Liabilities not covered by budgetary resources are those for which congressional appropriation is required. Liabilities not covered by budgetary resources include future environmental cleanup liability, legal claims, pensions and other retirement benefits, workers' compensation, annual leave, and cancelled appropriations.

Federal Employee and Veterans' Benefits

A liability is recorded for workers' compensation claims related to the Federal Employees' Compensation Act (FECA), administered by the U.S. Department of Labor. The FECA provides income and medical cost protection to covered federal civilian employees injured on the job, employees who have incurred a work-related occupational disease, and beneficiaries of employees whose death is attributable to a job-related injury or occupational disease. The FECA program initially pays valid claims and subsequently seeks reimbursement from the federal agencies employing the claimants. The FECA liability includes the actuarial liability for estimated future costs of death benefits, workers' compensation, and medical and miscellaneous costs for approved compensation cases.

Personnel Compensation and Benefits

Annual, Sick and Other Leave

Annual leave is accrued as it is earned; the accrual is reduced as leave is taken. Each year, the balance in the accrued annual leave account is adjusted to reflect current pay rates. To the extent current or prior year appropriations are not available to fund annual leave earned but not taken, funding will be obtained from future financing sources. Sick leave and other types of non-vested leave are expensed as taken.

Retirement Benefits

NASA employees participate in the Civil Service Retirement System (CSRS), a defined benefit plan, or the Federal Employees Retirement System (FERS), a defined benefit and contribution plan. For CSRS employees, NASA makes contributions of 7.0 percent of gross pay. For FERS employees, NASA makes contributions of gross pay of 11.9 percent to the defined benefit plan, 1.0 percent to a retirement savings plan (contribution plan), and matches employee contributions up to an additional 4.0 percent of gross pay. For those employees participating in FERS, a thrift savings plan is automatically established and NASA makes a mandatory contribution of 1.0 percent to this plan.

Insurance Benefits

SFFAS No. 5, *Accounting for Liabilities of the Federal Government* requires Government agencies to report the full cost of Federal Employee Health Benefits (FEHB), and the Federal Employees Group Life Insurance (FEGLI) Programs. NASA uses the applicable cost factors and data provided by the Office of Personnel and Management to value these liabilities.

Reclassifications of 2012 Information

Certain reclassifications have been made to FY 2012 financial statements, footnotes and supplemental information to better align with the Agency's strategic and performance plans effective in FY 2013.

Note 2: Non-Entity Assets

Non-entity assets are assets held by NASA but not available for obligation. The total non-entity assets during FY 2013 and FY 2012 is less than one-half million dollars.

(In Millions of Dollars)	2013	2012
Total Non-Entity Assets	$ —	$ —
Total Entity Assets	18,207	19,035
Total Assets	**$ 18,207**	**$ 19,035**

Note 3: Fund Balance With Treasury

Treasury processes cash receipts and disbursements for NASA. Those transactions are reconciled against NASA records. Fund Balance with Treasury (FBWT) is NASA's cash balance with the Treasury. The FBWT is comprised of balances in general funds, trust funds, working capital fund, and other types of funds. General Funds primarily consist of appropriated funds for NASA. Trust Funds include balances in the Endeavor Trust Fund; Challenger Trust Fund; and Gifts and Donations. Other types of funds include General Receipt funds; and Budget Clearing and Suspense funds.

(In Millions of Dollars)	2013	2012
Fund Balances:		
General Funds	$ 9,615	$ 9,779
Trust Funds	2	2
Working Capital Fund	147	118
Other Fund Types	7	2
Total	**$ 9,771**	**$ 9,901**

The Status of Fund Balance with Treasury represents the total fund balance recorded in the general ledger for unobligated and obligated balances. Unobligated Balances — Available is the amount remaining in appropriation funds available for obligation. Unobligated Balances — Unavailable is the amount remaining in appropriation funds used only for adjustments to previously recorded obligations. Obligated Balances - Not Yet Disbursed is the cumulative amount of obligations incurred for which outlays have not been made. Non-budgetary FBWT is comprised of amounts in other types of funds.

(In Millions of Dollars)	2013	2012
Status of Fund Balances with Treasury:		
Unobligated Balances		
Available	$ 903	$ 821
Unavailable	141	112
Obligated Balance Not Yet Disbursed	8,720	8,966
Non-Budgetary FBWT	7	2
Total	**$ 9,771**	**$ 9,901**

Note 4: Investments

Investments consist of non-marketable par value intragovernmental securities issued by Treasury's Bureau of the Fiscal Service. Trust Fund balances are invested in Treasury securities, which are purchased at either a premium or discount, and redeemed at par value exclusively through Treasury's Federal Investment Branch. The effective-interest method is used to amortize premiums on bonds, and the straight-line method is used to amortize discounts on bills.

Interest receivable on investments was less than one-half million dollars. In addition, NASA did not have any adjustments resulting from the sale of securities prior to maturity or any change in value that is more than temporary.

2013							
(In Millions of Dollars)	Cost	Amortization Method	Amortized (Premium) Discount	Interest Receivable	Investments, Net	Other Adjustments	Market Value Disclosure
Intragovernmental Securities:							
Non-Marketable:		Straight-Line					
Par value	$ 19	Effective-interest 0.025 - 6.602%	$ (2)	$ —	$ 17	$ —	$ 17
Total	**$ 19**		**$ (2)**	**$ —**	**$ 17**	**$ —**	**$ 17**

2012							
(In Millions of Dollars)	Cost	Amortization Method	Amortized (Premium) Discount	Interest Receivable	Investments, Net	Other Adjustments	Market Value Disclosure
Intragovernmental Securities:							
Non-Marketable:		Straight-Line					
Par value	$ 19	Effective-interest 0.115 – 6.602%	$ (2)	$ —	$ 17	$ —	$ 17
Total	**$ 19**		**$ (2)**	**$ —**	**$ 17**	**$ —**	**$ 17**

Note 5: Accounts Receivable, Net

The Accounts Receivable balance represents net valid claims by NASA to cash or other assets of other entities. Intragovernmental Accounts Receivable represents reimbursements due from other federal entities for goods and services provided by NASA on a reimbursable basis. Accounts Receivable Due from the Public is the total of miscellaneous debts owed to NASA from employees and/or smaller reimbursements from other non-federal entities. A periodic evaluation of public accounts receivable is performed to estimate any uncollectible amounts based on current status, financial and other relevant characteristics of debtors, and the overall relationship with the debtor. An allowance for doubtful accounts is recorded for Accounts Receivable Due from the Public in order to reduce Accounts Receivable to its Net Realizable Value in accordance with SFFAS No. 1, *Accounting for Selected Assets and Liabilities*. The total allowance for doubtful accounts during FY 2013 and FY 2012 is less than one–half million dollars.

2013			
(In Millions of Dollars)	Accounts Receivable	Allowance for Uncollectible Accounts	Net Amount Due
Intragovernmental	$ 156	$ —	$ 156
Public	2	—	2
Total	**$ 158**	**$ —**	**$ 158**

2012			
(In Millions of Dollars)	Accounts Receivable	Allowance for Uncollectible Accounts	Net Amount Due
Intragovernmental	$ 208	$ —	$ 208
Public	1	—	1
Total	**$ 209**	**$ —**	**$ 209**

Note 6: Property, Plant and Equipment, Net

NASA reports depreciation expense using the straight-line method over an asset's estimated useful life, beginning with the month the asset is placed in service. Property, plant and equipment (PP&E) with acquisition costs of $100,000 or more, a useful life of 2 years or more, and R&D assets that are determined at the time of acquisition to have alternative future use, are capitalized. PP&E and R&D assets that do not meet these capitalization criteria are expensed. Capitalized costs include costs incurred by NASA to bring the property to a form and location suitable for its intended use. Certain NASA assets are held by government contractors. Under provisions of the Federal Acquisition Regulation (FAR), the contractors are responsible for the control and accountability of the assets in their possession. These government-owned, contractor-held assets are included within the balances reported in NASA's financial statements. There is no known restriction to the use or convertibility of NASA PP&E.

2013					
(In Millions of Dollars)	Depreciation Method	Useful Life	Cost	Accumulated Depreciation	Book Value
Space Exploration PP&E					
International Space Station	Straight-line	5–20 years	$ 12,635	$ (9,701)	$ 2,934
Space Shuttle	Straight-line	5–20 years	743	(743)	—
Assets Under Construction		N/A	1,191	—	1,191
Total			**14,569**	**(10,444)**	**4,125**
General PP&E					
Land			122	—	122
Structures, Facilities and Leasehold Improvements	Straight-line	15–40 years	9,097	(6,770)	2,327
Institutional Equipment	Straight-line	5–20 years	2,305	(1,373)	932
Construction in Process		N/A	735	—	735
Internal Use Software and Development	Straight-line	5 years	266	(246)	20
Total			**12,525**	**(8,389)**	**4,136**
Total Property, Plant and Equipment			**$ 27,094**	**$ (18,833)**	**$ 8,261**

2012					
(In Millions of Dollars)	Depreciation Method	Useful Life	Cost	Accumulated Depreciation	Book Value
Space Exploration PP&E					
International Space Station	Straight-line	5–20 years	$ 12,369	$ (8,430)	$ 3,939
Space Shuttle	Straight-line	5–20 years	1,456	(1,456)	—
Assets Under Construction		N/A	1,590	—	1,590
Total			**15,415**	**(9,886)**	**5,529**
General PP&E					
Land			122	—	122
Structures, Facilities and Leasehold Improvements	Straight-line	15–40 years	8,878	(6,616)	2,262
Institutional Equipment	Straight-line	5–20 years	1,484	(1,239)	245
Construction in Process		N/A	710	—	710
Internal Use Software and Development	Straight-line	5 years	292	(254)	38
Total			**11,486**	**(8,109)**	**3,377**
Total Property, Plant and Equipment			**$ 26,901**	**$ (17,995)**	**$ 8,906**

Note 7: Stewardship PP&E

Federal agencies are required to classify and report heritage assets in accordance with SFFAS No. 29, *Heritage Assets and Stewardship Land*.

Stewardship PP&E have physical characteristics similar to those of General PP&E (G-PP&E) but differ from G-PP&E because their value is more intrinsic and not easily determinable in dollars. The only type of stewardship PP&E owned by NASA are heritage assets.

Heritage assets are G-PP&E which possess one or more of the following characteristics:

- Historical or natural significance
- Cultural, educational, or aesthetic value
- Significant architectural characteristics

Dollar value and useful life of heritage assets are not easily determinable. There is no minimum dollar threshold for designating a G-PP&E as heritage asset, and depreciation expense is not taken on these assets. For these reasons, heritage assets are reported in physical units, rather than with assigned dollar values. In accordance with SFFAS No. 29, the cost of acquisition, improvement, reconstruction, or renovation of heritage assets is expensed in the period incurred.

Heritage assets that are used in day-to-day government operations and have a heritage function are considered “multi-use” heritage assets. Such assets are accounted for as general property, plant and equipment and are capitalized and depreciated in the same manner as other general property, plant and equipment. As of September 30, 2013, NASA had 74 buildings and structures that are considered to be multi-use heritage assets. The value associated with these multi-use heritage assets is reflected in the G-PP&E values reported in Note 6.

When a G-PP&E is designated as heritage asset, its cost and accumulated depreciation are removed from the books. They remain on the record as heritage assets, except where there is legal authority for transfer or sale at which time they are removed from being a heritage asset. Heritage assets are withdrawn when they are disposed or reclassified as multi-use heritage assets. Heritage assets are generally in fair condition suitable for display.

NASA currently has three major classes of heritage assets: Buildings and Structures; Air and Space Displays and Artifacts; and Art and Miscellaneous Items. The first two categories of heritage assets support NASA’s mission by providing the public with tangible examples of assets which were built and deployed to support NASA’s mission. These real life assets enhance the public’s understanding of NASA’s numerous programs. Typically the Buildings and Structures have been designated as National Historic Landmarks.

The third category of heritage assets, Art and Miscellaneous Items, is mainly comprised of items created by artists who have contributed their time and talent to record their impressions of the U.S. Aerospace Program in paintings, drawings, and other media. These works of art not only provide a historic record of NASA projects, but they support NASA’s mission by giving the public a new and fuller understanding of advancements in aerospace.

(In Physical Units)	2012	Additions	Withdrawals	2013
Buildings and Structures	8	5	1	12
Air and Space Displays and Artifacts	635	37	32	640
Art and Miscellaneous Items	1,010	1	—	1,011
Total Heritage Assets	**1,653**	**43**	**33**	**1,663**

(In Physical Units)	2011	Additions	Withdrawals	2012
Buildings and Structures	13	—	5	8
Air and Space Displays and Artifacts	481	172	18	635
Art and Miscellaneous Items	1,005	6	1	1,010
Total Heritage Assets	**1,499**	**178**	**24**	**1,653**

Note 8: Other Assets

The Other Assets balance represents general PP&E assets that NASA determines are no longer needed and are awaiting disposal, retirement, or removal from services. These amounts are recorded at estimated net realizable value.

(In Millions of Dollars)	2013	2012
Removed from Service and Pending Disposal	$ —	$ 2
Total	**$ —**	**$ 2**

Note 9: Liabilities Not Covered by Budgetary Resources

Liabilities not covered by budgetary resources are liabilities for which congressional action is needed before budgetary resources can be provided. They include certain environmental matters (see Note 10, Environmental and Disposal Liabilities for more information), annual leave, workers' compensation under the Federal Employees' Compensation Act (FECA) administered by the Department of Labor, cancelled appropriations, legal claims, and pensions and other retirement benefits.

The present value of the FECA actuarial liability estimate at year-end was calculated by the Department of Labor using a discount rate of 2.73 percent in FY 2013 and 3.14 percent in FY 2012. This liability includes the estimated future costs for claims incurred but not reported or approved as of the end of each year. NASA has recorded Accounts Payable related to cancelled appropriations for which there are contractual commitments to pay. These payables will be funded from appropriations available for obligation at the time a bill is processed, in accordance with P.L. 101-510, National Defense Authorization Act.

(In Millions of Dollars)	2013	2012
Intragovernmental Liabilities:		
Other Liabilities		
Workers' Compensation	$ 12	$ 13
Total Intragovernmental	12	13
Public Liabilities:		
Accounts Payable		
Accounts Payable for Cancelled Appropriations	37	34
Federal Employee and Veterans Benefits		
Actuarial FECA Liability	51	50
Environmental and Disposal Liabilities	1,243	1,169
Less: Environmental and Disposal Liabilities- Funded	49	37
Other Liabilities		
Unfunded Annual Leave	205	207
Total Liabilities Not Covered by Budgetary Resources	**1,499**	**1,436**
Total Liabilities Covered by Budgetary Resources	**2,776**	**2,849**
Total Liabilities	**$ 4,275**	**$ 4,285**

Note 10: Environmental and Disposal Liabilities

In accordance with guidance issued by the Federal Accounting Standards Advisory Board, if an agency is required by regulation to clean up hazardous waste resulting from Federal operations, if estimable, the amount of cleanup cost must be reported and/or disclosed in the financial statements.

NASA records an estimated liability for restoration projects, which are known contaminations of property, plant and equipment (PP&E). NASA also records an estimated liability for the future disposal of PP&E which currently, or prior to their disposal, will become contaminated.

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

Environmental and Disposal Liabilities represent cleanup costs resulting from:

- Operations including facilities obtained from other governmental entities, that have resulted in contamination from waste disposal methods, leaks and spills;
- Other past activity that created a public health or environmental risk, including identifiable costs associated with asbestos abatement; and
- Total cleanup costs associated with the removal, containment, and/or disposal of hazardous wastes or material and/or property at permanent or temporary closure or shutdown of associated property, plant and equipment (PP&E).

Federal, state, and local statutes and regulations require environmental cleanup. The statutes and regulations most applicable to NASA covering environmental response, cleanup, and monitoring include: the Comprehensive Environmental Response, Compensation and Liability Act; the Resource Conservation and Recovery Act; the Nuclear Waste Policy Act of 1982; as well as state and local laws.

Consistent with SFFAS No. 5, *Accounting for Liabilities of the Federal Government and with SFFAS 6, Accounting for Property, Plant, and Equipment*, NASA estimates the anticipated environmental disposal cleanup costs for capital PP&E. NASA recognizes and records in its financial statements an environmental cleanup liability for PP&E with a probable and measurable environmental cleanup liability.

(In Millions of Dollars)	2013	2012
Environmental Liabilities		
Restoration Properties	$ 1,158	$ 1,086
Property, Plant & Equipment	63	83
Asbestos	22	—
Total Environmental and Disposal Liabilities	**$ 1,243**	**$ 1,169**

Restoration Projects

NASA recorded a total estimated liability for known restoration projects of $1,158 million in FY 2013. This was an increase of $72 million over the $1,086 million recorded in FY 2012. The increase in this liability is primarily due to the availability of new or updated information on the extent of contamination and refinements to the estimation methodology.

In addition to the probable cleanup costs for known hazardous conditions recognized in the financial statements, there are other remediation sites where the likelihood of required cleanup for known hazardous conditions is reasonably possible. Remediation costs at certain sites classified as reasonably possible were estimated to be $1 million for FY 2013 and FY 2012.

With respect to environmental remediation that NASA considers reasonably possible but not estimable, NASA concluded that either the likelihood of a NASA liability is less than probable but more than remote or the regulatory drivers and/or technical data that exist are not reliable enough to calculate an estimate.

PP&E

NASA recorded a total estimated liability for the future closure of PP&E of $63 million in FY 2013. This was a decrease of $20 million over the $83 million recorded in FY 2012. The decrease in this liability is primarily due to refinements in the estimation methodology.

The current proposed decommissioning approach for the International Space Station (ISS) is to execute a controlled targeted deorbit to a remote ocean location. This is consistent with the approach used to deorbit other space vehicles such as Russia's Progress, Europe's Automated Transfer Vehicle (ATV) and Japan's H-II Transfer Vehicle (HTV). The documented target reliability for this decommissioning approach is 99 percent. Prior to decommissioning the ISS, any hazardous materials on board the ISS would be removed or jettisoned. As a result, only residual quantities of hazardous, toxic, and radioactive materials would remain prior to the decommissioning.

Based on past experience with the re-entry of satellites, larger portions or fragments of the ISS would be expected to survive the thermal and aerodynamic stresses of re-entry. However, the historical disposal of satellites and vehicles into broad ocean areas with a

controlled deorbit has left little evidence of their re-entry. Any remaining contamination in the ISS debris field would not be expected to have a substantive impact on marine life. Therefore, the probability of NASA incurring environmental cleanup costs related to the ISS is remote and no estimate for such costs has been developed or reported in these financial statements.

Asbestos

Effective in FY 2013, NASA and other Federal Government agencies are required to accrue and/or disclose the costs and the associated liabilities for abatement of both friable and non-friable asbestos. NASA maintains numerous structures and facilities across each of the Centers which are known to contain asbestos. Based on work completed to date, NASA has determined that information regarding both the quantity of asbestos and the costs associated with the removal and disposal of asbestos is insufficient to reasonably estimate the liability associated with the removal and disposal of asbestos.

As prescribed in FASAB Technical Release 10, *Implementation Guidance on Asbestos Cleanup Costs Associated with Facilities and Installed Equipment*, NASA determined that completing site specific inventories of asbestos, and gathering reliable cost estimates regarding the removal and disposal of asbestos, would cost an estimated $22 million.

Note 11: Other Liabilities

Other Liabilities are comprised of intragovernmental liabilities and liabilities with public entities. Other Accrued Liabilities primarily consist of the accrual of contractor costs for goods and services. The period of performance for contractor contracts typically spans the duration of NASA programs, which could be for a number of years prior to final delivery of the product. In such cases, NASA records a cost accrual throughout the fiscal year as the work is performed. Advances from Others primarily consists of payments received from other federal agencies in advance of the performance of services under reimbursable agreements. Other Liabilities also includes federal employee payroll and benefit liabilities, including unfunded annual leave and funded sick leave that has been earned but not taken, and salaries and wages that have been earned but are unpaid.

2013			
(In Millions of Dollars)	Current	Non-Current	Total
Intragovernmental Liabilities:			
Advances From Others	$ 67	$ —	$ 67
Workers' Compensation	5	7	12
Employer Contributions and Payroll Taxes	9	—	9
Liability for Non-Entity Assets	1	—	1
Other Accrued Liability	3	—	3
Total Intragovernmental	**85**	**7**	**92**
Unfunded Annual Leave	—	205	205
Accrued Funded Payroll	51	—	51
Advances from Others	100	—	100
Employer Contributions and Payroll Taxes	5	—	5
Liability for Deposit and Clearing Funds	6		6
Other Accrued Liabilities	1,119	—	1,119
Total Public	**1,281**	**205**	**1,486**
Total Other Liabilities	**$ 1,366**	**$ 212**	**$ 1,578**

2012			
(In Millions of Dollars)	Current	Non-Current	Total
Intragovernmental Liabilities:			
Advances From Others	$ 61	$ —	$ 61
Workers' Compensation	5	8	13
Employer Contributions and Payroll Taxes	7	—	7
Liability for Non-Entity Assets	1	—	1
Other Accrued Liability	3	—	3
Total Intragovernmental	**77**	**8**	**85**
Unfunded Annual Leave	-	207	207
Accrued Funded Payroll	43	—	43
Advances from Others	90	—	90
Employer Contributions and Payroll Taxes	4	—	4
Liability for Deposit and Clearing Funds	2	—	2
Other Accrued Liabilities	1,176	—	1,176
Total Public	**1,315**	**207**	**1,522**
Total Other Liabilities	**$ 1,392**	**$ 215**	**$ 1,607**

Note 12: Commitments and Contingencies

NASA is a party in various administrative proceedings, court actions (including tort suits), and claims. For cases which management and legal counsel believe it is probable that the outcomes will result in a loss to NASA, contingent liabilities are recorded. There were certain cases reviewed by legal counsel where the probable future loss is remote and as such no contingent liability has been recorded in connection with these cases.

NASA has a contract with the California Institute of Technology (Caltech) to manage the Agency's Jet Propulsion Laboratory (JPL). Currently, Caltech seeks reimbursement from NASA for postretirement benefits other than pension costs on a pay-as-you-go basis. NASA and the contractor are negotiating a modification to the contract to address these costs going forward. The parties are currently working to definitize the terms of the agreement.

There are certain other contracts which may contain provisions regarding contingent obligations to fund accumulated unfunded employee benefit plans upon contract termination. Currently, these potential liabilities are not measurable.

Note 13: Intragovernmental Cost and Exchange Revenue

Intragovernmental costs and revenue are exchange transactions made between NASA and other federal government entities. Costs and revenue with the Public result from transactions between NASA and non-federal entities.

(In Millions of Dollars)	2013	2012
Strategic Goal 1 – Human Exploration		
Intragovernmental Costs	$ 150	$ 181
Public Costs	7,512	7,948
Total Gross Costs	7,662	8,129
Less:		
Intragovernmental Earned Revenue	206	256
Public Earned Revenue	68	75
Total Earned Revenue	274	331
Net Cost	**$ 7,388**	**$ 7,798**
Strategic Goal 2 – Scientific Understanding of Universe		
Intragovernmental Costs	$ 304	$ 287
Public Costs	5,486	5,256
Total Gross Costs	5,790	5,543
Less:		
Intragovernmental Earned Revenue	1,549	1,336
Public Earned Revenue	12	13
Total Earned Revenue	1,561	1,349
Net Cost	**$ 4,229**	**$ 4,194**
Strategic Goal 3 – Space Technology Development		
Intragovernmental Costs	$ 38	$ 17
Public Costs	640	274
Total Gross Costs	678	291
Less:		
Total Earned Revenue	—	—
Net Cost	**$ 678**	**$ 291**
Strategic Goal 4 – Aeronautics Research for Nation		
Intragovernmental Costs	$ 36	$ 44
Public Costs	488	506
Total Gross Costs	524	550
Less:		
Intragovernmental Earned Revenue	73	84
Public Earned Revenue	22	20
Total Earned Revenue	95	104
Net Cost	**$ 429**	**$ 446**
Strategic Goal 5 – Mission Support		
Intragovernmental Costs	$ 593	$ 598
Public Costs	4,837	4,758
Total Gross Costs	5,430	5,356
Less:		
Intragovernmental Earned Revenue	289	235
Public Earned Revenue	66	55
Total Earned Revenue	355	290
Net Cost	**$ 5,075**	**$ 5,066**
Strategic Goal 6 – Education and Communication		
Intragovernmental Costs	$ 2	$ 1
Public Costs	133	159
Total Gross Costs	135	160
Less:		
Total Earned Revenue	—	—
Net Cost	**135**	**160**
Net Cost of Operations	**$ 17,934**	**$ 17,955**

Note 14: Apportionment Categories of Obligations Incurred: Direct vs. Reimbursable Obligations

(In Millions of Dollars)	2013	2012
Direct Obligations:		
Category A	$ 1	$ 1
Category B	16,997	18,155
Reimbursable Obligations:		
Category B	2,713	2,529
Total Obligations Incurred	**$ 19,711**	**$ 20,685**

Category A consists of amounts requested to be apportioned annually and distributed for each calendar quarter in the fiscal year. Category B consists of amounts requested to be apportioned on a basis other than calendar quarters, such as time periods other than quarters, activities, projects, objects, or a combination thereof.

Note 15: Explanation of Differences Between the Statement of Budgetary Resources (SBR) and the Budget of the U.S. Government

The FY 2015 *Budget of the United States Government* (President's Budget) presenting the actual amounts for the year ended September 30, 2013 has not been published as of the issue date of these financial statements.

NASA reconciled the amounts of the FY 2012 column on the SBR to the actual amounts for FY 2012 in the FY 2014 President's Budget for budgetary resources, obligations incurred, distributed offsetting receipts, and net outlays as presented below.

(In Millions of Dollars)	Budgetary Resources	Obligations	Distributed Offsetting Receipts	Net Outlays
Combined Statement of Budgetary Resources	**$ 21,618**	**$ 20,685**	**$ (3)**	**$ 17,190**
Included on SBR, not in President's Budget				
Expired Accounts	(188)	(75)	—	—
Distributed Offsetting Receipts	—	—	3	(3)
Budget of the United States Government	**$ 21,430**	**$ 20,610**	**$ —**	**$ 17,187**

The difference between the SBR and the President's Budget represents expired accounts and distributed offsetting receipts reported on the SBR but not in the President's Budget.

Note 16: Undelivered Orders at the End of the Period

Undelivered Orders represent the amount of goods and/or services ordered to perform NASA mission objectives, which have not been received. The total Undelivered Orders at the end of the period totaled $7.3 billion and $7.7 billion as of September 30, 2013 and September 30, 2012, respectively.

Note 17: Reconciliation of Net Cost to Budget

SFFAS No.7, *Accounting for Revenues and Other Financing Concepts for Reconciling Budgetary and Financial Accounting*, requires a reconciliation of proprietary and budgetary accounting information. Accrual-based measures used in the Statement of Net Cost differ from the obligation-based measures used in the Statement of Budgetary Resources. This reconciliation shows the relationship between the net obligations derived from the Statement of Budgetary Resources and net costs of operations derived from the Statement of Net Cost by identifying and explaining key items that affect one statement but not the other.

(In Millions of Dollars)	2013	2012
Resources Used to Finance Activities		
Budgetary Resources Obligated		
Obligations Incurred	$ 19,711	$ 20,685
Less: Spending Authority from Offsetting Collections and Recoveries	2,968	3,207
Obligations Net of Offsetting Collections and Recoveries	16,743	17,478
Less: Offsetting Receipts	—	(6)
Net Obligations	16,743	17,484
Other Resources		
Donations & Forfeitures of Property	3	4
Transfers In/Out Without Reimbursements	109	100
Imputed Financing from Costs Absorbed by Others	150	176
Net Other Resources Used to Finance Activities	262	280
Total Resources Used to Finance Activities	**17,005**	**17,764**
Resources Used to Finance Items Not Part of the Net Cost of Operations		
Change in Budgetary Resources Obligated for Goods, Services, and Benefits Ordered But Not Yet Provided	207	(440)
Resources that Fund Expenses Recognized in Prior Periods	(3)	(294)
Budgetary Offsetting Collections and Receipts that Do Not Affect the Net Costs of Operations—Other	—	(6)
Resources that Finance the Acquisition of Assets	(1,155)	(1,113)
Other Resources or Adjustments to Net Obligated Resources that Do Not Affect Net Cost of Operations	(3)	(4)
Total Resources Used to Finance Items Not Part of the Net Cost of Operations	**(954)**	**(1,857)**
Total Resources Used to Finance the Net Cost of Operations	**$ 16,051**	**$ 15,907**
Components of Net Cost that Will Not Require or Generate Resources in the Current Period		
Components Requiring or Generating Resources in Future Periods		
Increases in Environmental and Disposal Liability	$ 74	$ —
Other	3	—
Total Components of Net Cost that Will Require or Generate Resources in Future Periods	77	—
Components Not Requiring or Generating Resources		
Depreciation	1,569	1,443
Revaluation of Assets or Liabilities	1	(8)
Other	236	613
Total Components of Net Cost of Operations that Will Not Require or Generate Resources	1,806	2,048
Total Components of Net Cost of Operations that Will Not Require or Generate Resources in the Current Period	**1,883**	**2,048**
Net Cost of Operations	**$ 17,934**	**$ 17,955**

Required Supplementary Stewardship Information

Stewardship Investments: Research and Development

NASA's strategic goals and outcomes are the basis of the Agency's performance framework and are executed to support its strategic plan. To provide a complete analysis of NASA costs, both Research and Development and non-R&D costs are presented. Descriptions for the strategic goals and outcomes associated with these costs are also presented.

Research and Development Costs by Strategic Goal

(In Millions of Dollars)	2013	2012	2011	2010	2009
Research and Development Costs					
Basic					
Strategic Goal 1 - Human Exploration	$ 335	$ 303	$ 258	$ 363	$ 18
Strategic Goal 2 - Scientific Understanding of Universe	2,540	866	851	842	817
Strategic Goal 3 - Space Technology Development	-	11	-	-	-
Strategic Goal 4 - Aeronautics Research for Nation	-	-	-	-	-
Strategic Goal 5 - Mission Support	-	-	22	22	6
Strategic Goal 6 - Education and Communication	-	-	-	-	-
Total Basic Expenses	**$ 2,875**	**$ 1,180**	**$ 1,131**	**$ 1,227**	**$ 841**
Applied					
Strategic Goal 1 - Human Exploration	$ 1,506	$ 1,550	$ 1,383	$ 1,924	$ 169
Strategic Goal 2 - Scientific Understanding of Universe	218	38	38	41	40
Strategic Goal 3 - Space Technology Development	355	11	-	-	-
Strategic Goal 4 - Aeronautics Research for Nation	445	442	429	464	465
Strategic Goal 5 - Mission Support	66	-	114	103	84
Strategic Goal 6 - Education and Communication	-	-	-	-	-
Total Applied Expenses	**$ 2,590**	**$ 2,041**	**$ 1,964**	**$ 2,532**	**$ 758**
Development					
Strategic Goal 1 - Human Exploration	$ 3,409	$ 1,789	$ 2,616	$ 3,425	$ 1,853
Strategic Goal 2 - Scientific Understanding of Universe	1,409	1,834	2,097	2,004	1,917
Strategic Goal 3 - Space Technology Development	279	8	-	-	-
Strategic Goal 4 - Aeronautics Research for Nation	-	-	-	-	-
Strategic Goal 5 - Mission Support	118	-	46	43	21
Strategic Goal 6 - Education and Communication	-	-	-	-	-
Total Development Expenses	**$ 5,215**	**$ 3,631**	**$ 4,759**	**$ 5,472**	**$ 3,791**
Total Research and Development	**$ 10,680**	**$ 6,852**	**$ 7,854**	**$ 9,231**	**$ 5,390**
Non-Research and Development Cost					
Strategic Goal 1 - Human Exploration	$ 2,412	$ 4,487	$ 4,669	$ 4,608	$ 7,548
Strategic Goal 2 - Scientific Understanding of Universe	1,623	2,805	2,508	2,162	2,188
Strategic Goal 3 - Space Technology Development	44	261	-	-	-
Strategic Goal 4 - Aeronautics Research for Nation	79	108	138	101	109
Strategic Goal 5 - Mission Support	5,246	5,356	4,532	6,316	8,317
Strategic Goal 6 - Education and Communication	135	160	181	149	105
Total Non-Research and Development Expenses	**$ 9,539**	**$ 13,177**	**$ 12,028**	**$ 13,336**	**$ 18,267**
Total Expenses	**$ 20,219**	**$ 20,029**	**$ 19,882**	**$ 22,567**	**$ 23,657**

NASA makes substantial research and development investments for the benefit of the nation. These amounts are expensed as incurred in determining the gross cost of operations.

NASA's R&D programs include activities to extend our knowledge of Earth, its space environment, and the universe, and to invest in new aeronautics and advanced space transportation technologies that support the development and application of technologies critical to the economic, scientific, and technical competitiveness of the United States.

Investment in R&D refers to those expenses incurred to support the search for new or refined knowledge and ideas and for the application or use of such knowledge and ideas for the development of new or improved products and processes with the expectation of maintaining or increasing national economic productive capacity or yielding other future benefits.

Research and Development: Strategic Goals and Outcomes

Strategic Goal 1: Human Exploration

Extend and sustain human activities across the solar system.

Major Projects Include:
- Commercial Crew and Launch Vehicles
- Space Radiation
- ISS Spacecraft Operations

Outcomes:
- Sustain the operation and full use of the International Space Station (ISS) and expand efforts to utilize the ISS as a National Laboratory for scientific, technological, diplomatic, and educational purposes and for supporting future objectives in human space exploration.
- Develop competitive opportunities for the commercial community to provide best value products and services to low Earth orbit and beyond.
- Develop an integrated architecture and capabilities for safe crewed and cargo missions beyond low Earth orbit.

Strategic Goal 2: Scientific Understanding of Universe

Expand scientific understanding of the Earth and the universe in which we live.

Major Projects Include:
- Airborne Science
- Chandra X-Ray Observatory
- High-End Computing Capability
- Hubble Space Telescope Operations
- ICESAT-2
- Landsat Data Continuity Mission
- Mars Science Labs
- Multi-Mission Operations
- Nuclear Power Radioisotope System
- Soil Moisture Active and Passive
- Sounding Rockets
- Stratospheric Observatory for Infrared

Outcomes:
- Advance Earth system science to meet the challenges of climate and environmental change.
- Understand the Sun and its interactions with Earth and the solar system.
- Ascertain the content, origin, and evolution of the solar system and the potential for life elsewhere.
- Discover how the universe works, explore how it began and evolved, and search for Earth-like planets.

Strategic Goal 3: Space Technology Development

Create the innovative new space technologies for our exploration, science, and economic future.

Major Projects Include:
- Game-Changing Development — Human Robotic Systems
- Game-Changing Development — Composite Cryotanks
- Technology Demonstration Missions - Inflatable Aero Decelerators (LDSD)
- Technology Demonstration Missions — Cryo Propellant Transfer & Storage
- ST Small Business Technology Transfer
- Spacecraft Servicing

Outcomes:
- Sponsor early-stage innovation in space technologies in order to improve the future capabilities of NASA, other government agencies, and the aerospace industry.
- Infuse game-changing and crosscutting technologies throughout the Nation's space enterprise to transform the Nation's space mission capabilities.
- Develop and demonstrate the critical technologies that will make NASA's exploration, science, and discovery missions more affordable and more capable.
- Facilitate the transfer of NASA technology and engage in partnerships with other government agencies, industry, and international entities to generate U.S. commercial activity and other public benefits.

Strategic Goal 4: Aeronautics Research for Nation

Advance aeronautics research for societal benefit.

Major Projects Include:
- Environmentally Responsible Aviation
- Fixed Wing Project
- NextGen Concepts and Technology
- Vehicle Systems Safety Technologies

Outcomes:
- Develop innovative solutions and advanced technologies through a balanced research portfolio to improve current and future air transportation.
- Conduct systems-level research on innovative and promising aeronautics concepts and technologies to demonstrate integrated capabilities and benefits in a relevant flight and/or ground environment.

Strategic Goal 5: Mission Support

Enable program and institutional capabilities to conduct NASA's aeronautics and space activities.

Outcomes:
- Identify, cultivate, and sustain a diverse workforce and inclusive work environment that is needed to conduct NASA missions.
- Ensure vital assets are ready, available, and appropriately sized to conduct NASA's missions.
- Ensure the availability to the Nation of NASA-owned, strategically important test capabilities.
- Implement and provide space communications and launch capabilities responsive to existing and future science and space exploration missions.
- Establish partnerships, including innovative arrangements, with commercial, international, and other government entities to maximize mission success.

Strategic Goal 6: Education and Communication

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.

Outcomes:

- Improve retention of students in STEM disciplines by providing opportunities and activities along the full length of the education pipeline.
- Promote STEM literacy through strategic partnerships with formal and informal organizations.
- Engage the public in NASA's missions by providing new pathways for participation.
- Inform, engage, and inspire the public by sharing NASA's missions, challenges, and results.

Note: For more information on strategic goals descriptions and achievements/outcomes, please refer to pages 21-46.

Required Supplementary Information

Combining Schedule of Budgetary Resources For the Fiscal Year Ended September 30, 2013

(In Millions of Dollars)	Space Operations Mission	Science Mission	Exploration Mission	Aeronautics Mission	Cross-Agency Mission	Education Mission
Budgetary Resources:						
Unobligated Balance, Brought Forward, October 1	$ 108	$ 73	$ 96	$ 18	$ 383	$ 21
Recoveries of Prior Year Unpaid Obligations	110	92	52	9	46	3
Other Changes in Unobligated Balance	—	—	—	—	—	—
Unobligated Balance from Prior Year Budget Authority, Net	218	165	148	27	429	24
Appropriations	3,725	4,781	3,705	530	2,711	116
Spending Authority from Offsetting Collections	4	1	2	—	2,211	—
Total Budgetary Resources	**$ 3,947**	**$ 4,947**	**$ 3,855**	**$ 557**	**$ 5,351**	**$ 140**
Status of Budgetary Resources:						
Obligations Incurred	$ 3,777	$ 4,755	$ 3,802	$ 542	$ 5,051	$ 122
Unobligated Balance, End of Year:						
Apportioned	99	178	47	13	283	15
Unapportioned	71	14	6	2	17	3
Total Unobligated Balance, End of Period	170	192	53	15	300	18
Total Status of Budgetary Resources	**$ 3,947**	**$ 4,947**	**$ 3,855**	**$ 557**	**$ 5,351**	**$ 140**
Change in Obligated Balance:						
Unpaid Obligations:						
Unpaid Obligations, Brought Forward, October 1	$ 1,756	$ 3,070	$ 1,946	$ 256	$ 2,086	$ 178
Obligations Incurred	3,777	4,755	3,802	542	5,051	122
Outlays (Gross) (-)	(3,819)	(4,703)	(4,030)	(558)	(5,274)	(133)
Recoveries of Prior Year Unpaid Obligations (-)	(110)	(92)	(52)	(9)	(46)	(3)
Unpaid Obligations, End of Year	1,604	3,030	1,666	231	1,817	164
Uncollected payments:						
Uncollected Payments, Federal Sources, Brought Forward, October 1 (-)	—	—	—	—	(1,314)	—
Change in Uncollected Payments, Federal sources	—	—	—	—	265	—
Uncollected Payments, Fed Sources, End of Year (-)	—	—	—	—	(1,049)	—
Memorandum (Non-Add) Entries:						
Obligated Balance, Start of Year	**1,756**	**3,070**	**1,946**	**256**	**772**	**178**
Obligated Balance, End of Year	**$ 1,604**	**$ 3,030**	**$ 1,666**	**$ 231**	**$ 768**	**$ 164**
Budget Authority and Outlays, Net:						
Budget Authority, Gross	$ 3,729	$ 4,782	$ 3,707	$ 530	$ 4,922	$ 116
Actual Offsetting Collections (-)	(4)	(1)	(2)	—	(2,475)	—
Change in Uncollected Customer Payments from Federal Sources	—	—	—	—	265	—
Anticipated Offsetting Collections	—	—	—	—	—	—
Budget Authority, Net	**3,725**	**4,781**	**3,705**	**530**	**2,712**	**116**
Outlays, Gross	3,819	4,703	4,030	558	5,274	133
Actual Offsetting Collections (-)	(4)	(1)	(2)	—	(2,475)	—
Outlays, Net	3,815	4,702	4,028	558	2,799	133
Distributed Offsetting Receipts (-)	—	—	—	—	—	—
Agency Outlays, Net	**$ 3,815**	**$ 4,702**	**$ 4,028**	**$ 558**	**$ 2,799**	**$ 133**

Combining Schedule of Budgetary Resources
For the Fiscal Year Ended September 30, 2013 (continued)

(In Millions of Dollars)	Office of Inspector General	American Recovery and Rein-vestment Act	Space Technology Mission	Construction and Environmental Compliance and Restoration	Other	Total
Budgetary Resources:						
Unobligated Balance, Brought Forward, October 1	$ 3	$ 2	$ 14	$ 172	$ 43	$ 933
Recoveries of Prior Year Unpaid Obligations	—	—	7	12	20	351
Other Changes in Unobligated Balance	—	—	—	—	(26)	(26)
Unobligated Balance from Prior Year Budget Authority, Net	3	2	21	184	37	1,258
Appropriations	36	—	614	661	1	16,880
Spending Authority from Offsetting Collections	1	—	—	3	395	2,617
Total Budgetary Resources	**$ 40**	**$ 2**	**$ 635**	**$ 848**	**$ 433**	**$ 20,755**
Status of Budgetary Resources:						
Obligations Incurred	$ 36	$ —	$ 623	$ 601	$ 402	$ 19,711
Unobligated Balance, End of Year:						
Apportioned	1	—	11	246	10	903
Unapportioned	3	2	1	1	21	141
Total Unobligated Balance, End of Period	4	2	12	247	31	1,044
Total Status of Budgetary Resources	**$ 40**	**$ 2**	**$ 635**	**$ 848**	**$ 433**	**$ 20,755**
Change in Obligated Balance:						
Unpaid Obligations:						
Unpaid Obligations, Brought Forward, October 1	$ 5	$ 11	$ 292	$ 511	$ 173	$ 10,284
Obligations Incurred	36	—	623	601	402	19,711
Outlays (Gross) (-)	(37)	(1)	(552)	(377)	(389)	(19,873)
Recoveries of Prior Year Unpaid Obligations (-)	—	—	(7)	(12)	(20)	(351)
Unpaid Obligations, End of Year	4	10	356	723	166	9,771
Uncollected payments:						
Uncollected Payments, Federal Sources, Brought Forward, October 1 (-)	—	—	—	—	(4)	(1,318)
Change in Uncollected Payments, Federal sources	—	—	—	—	2	267
Uncollected Payments, Fed Sources, End of Year (-)	—	—	—	—	(2)	(1,051)
Memorandum (Non-Add) Entries:						
Obligated Balance, Start of Year	**5**	**11**	**292**	**511**	**169**	**8,966**
Obligated Balance, End of Year	**$ 4**	**$ 10**	**$ 356**	**$ 723**	**$ 164**	**$ 8,720**
Budget Authority and Outlays, Net:						
Budget Authority, Gross	$ 37	$ —	$ 614	$ 664	$ 396	$ 19,497
Actual Offsetting Collections (-)	(1)	—	—	(3)	(398)	(2,884)
Change in Uncollected Customer Payments from Federal Sources	—	—	—	—	2	267
Anticipated Offsetting Collections	—	—	—	—	—	—
Budget Authority, Net	**36**	**—**	**614**	**661**	**—**	**16,880**
Outlays, Gross	37	1	552	377	389	19,873
Actual Offsetting Collections (-)	(1)	—	—	(3)	(398)	(2,884)
Outlays, Net	36	1	552	374	(9)	16,989
Distributed Offsetting Receipts (-)	—	—	—	—	(13)	(13)
Agency Outlays, Net	**$ 36**	**$ 1**	**$ 552**	**$ 374**	**$ (22)**	**$ 16,976**

Combining Schedule of Budgetary Resources
For the Fiscal Year Ended September 30, 2012

(In Millions of Dollars)	Space Operations Mission	Science Mission	Exploration Mission	Aeronautics Mission	Cross-Agency Mission	Education Mission
Budgetary Resources:						
Unobligated Balance, Brought Forward, October 1	$ 130	$ 83	$ 189	$ 12	$ 42	$ 28
Recoveries of Prior Year Unpaid Obligations	180	58	59	6	29	3
Other Changes in Unobligated Balance	—	—	—	—	—	—
Unobligated Balance from Prior Year Budget Authority, Net	310	141	248	18	71	31
Appropriations	4,192	5,074	3,716	569	3,003	136
Spending Authority from Offsetting Collections	10	—	—	—	2,557	—
Total Budgetary Resources	**$ 4,512**	**$ 5,215**	**$ 3,964**	**$ 587**	**$ 5,631**	**$ 167**
Status of Budgetary Resources:						
Obligations Incurred	$ 4,404	$ 5,142	$ 3,868	$ 569	$ 5,248	$ 146
Unobligated Balance, End of Year:						
Apportioned	64	63	92	17	370	18
Unapportioned	44	10	4	1	13	3
Total Unobligated Balance, End of Period	108	73	96	18	383	21
Total Status of Budgetary Resources	**$ 4,512**	**$ 5,215**	**$ 3,964**	**$ 587**	**$ 5,631**	**$ 167**
Change in Obligated Balance:						
Unpaid Obligations:						
Unpaid Obligations, Brought Forward, October 1	$ 2,018	$ 2,764	$ 1,712	$ 259	$ 1,918	$ 187
Obligations Incurred	4,404	5,142	3,868	569	5,248	146
Outlays (Gross) (-)	(4,486)	(4,778)	(3,575)	(566)	(5,051)	(152)
Recoveries of Prior Year Unpaid Obligations (-)	(180)	(58)	(59)	(6)	(29)	(3)
Unpaid Obligations, End of Year	1,756	3,070	1,946	256	2,086	178
Uncollected payments:						
Uncollected Payments, Federal Sources, Brought Forward, October 1 (-)	(5)	—	—	—	(832)	—
Change in Uncollected Payments, Federal sources	5	—	—	—	(482)	—
Uncollected Payments, Fed Sources, End of Year (-)	0	—	—	—	(1,314)	—
Memorandum (Non-Add) Entries:						
Obligated Balance, Start of Year	**2,013**	**2,764**	**1,712**	**259**	**1,086**	**187**
Obligated Balance, End of Year	**$ 1,756**	**$ 3,070**	**$ 1,946**	**$ 256**	**$ 772**	**$ 178**
Budget Authority and Outlays, Net:						
Budget Authority, Gross	$ 4,202	$ 5,074	$ 3,716	$ 569	$ 5,560	$ 136
Actual Offsetting Collections (-)	(15)	—	—	—	(2,075)	—
Change in Uncollected Customer Payments from Federal Sources	5	—	—	—	(482)	—
Anticipated Offsetting Collections	—	—	—	—	—	—
Budget Authority, Net	**$ 4,192**	**$ 5,074**	**$ 3,716**	**$ 569**	**$ 3,003**	**$ 136**
Outlays, Gross	4,486	4,778	3,575	566	5,051	152
Actual Offsetting Collections (-)	(15)	—	—	—	(2,075)	—
Outlays, Net	4,471	4,778	3,575	566	2,976	152
Distributed Offsetting Receipts (-)	—	—	—	—	—	—
Agency Outlays, Net	**$ 4,471**	**$ 4,778**	**$ 3,575**	**$ 566**	**$ 2,976**	**$ 152**

Combining Schedule of Budgetary Resources
For the Fiscal Year Ended September 30, 2012 (continued)

(In Millions of Dollars)	Office of Inspector General	American Recovery and Rein-vestment Act	Space Technology Mission	Construction and Environmental Compliance and Restoration	Other	Total
Budgetary Resources:						
Unobligated Balance, Brought Forward, October 1	$ 3	$ 2	$ —	$ 109	$ 79	$ 677
Recoveries of Prior Year Unpaid Obligations	—	1	—	5	24	365
Other Changes in Unobligated Balance	—	—	—	—	(37)	(37)
Unobligated Balance from Prior Year Budget Authority, Net	3	3	—	114	66	1,005
Appropriations	38	—	548	495	—	17,771
Spending Authority from Offsetting Collections	1	—	—	2	272	2,842
Total Budgetary Resources	**$ 42**	**$ 3**	**$ 548**	**$ 611**	**$ 338**	**$ 21,618**
Status of Budgetary Resources:						
Obligations Incurred	$ 39	$ 1	$ 534	$ 439	$ 295	$ 20,685
Unobligated Balance, End of Year:						
Apportioned	1	—	14	172	10	821
Unapportioned	2	2	—	—	33	112
Total Unobligated Balance, End of Period	3	2	14	172	43	933
Total Status of Budgetary Resources	**$ 42**	**$ 3**	**$ 548**	**$ 611**	**$ 338**	**$ 21,618**
Change in Obligated Balance:						
Unpaid Obligations:						
Unpaid Obligations, Brought Forward, October 1	$ 4	$ 56	$ —	$ 460	$ 148	$ 9,526
Obligations Incurred	39	1	534	439	295	20,685
Outlays (Gross) (-)	(38)	(45)	(242)	(383)	(246)	(19,562)
Recoveries of Prior Year Unpaid Obligations (-)	—	(1)	—	(5)	(24)	(365)
Unpaid Obligations, End of Year	5	11	292	511	173	10,284
Uncollected payments:						
Uncollected Payments, Federal Sources, Brought Forward, October 1 (-)	—	(1)	—	—	(13)	(851)
Change in Uncollected Payments, Federal sources	—	1	—	—	9	(467)
Uncollected Payments, Fed Sources, End of Year (-)	—	—	—	—	(4)	(1,318)
Memorandum (Non-Add) Entries:						
Obligated Balance, Start of Year	**4**	**55**	**—**	**460**	**135**	**8,675**
Obligated Balance, End of Year	**$ 5**	**$ 11**	**$ 292**	**$ 511**	**$ 169**	**$ 8,966**
Budget Authority and Outlays, Net:						
Budget Authority, Gross	$ 39	$ —	$ 548	$ 497	$ 272	$ 20,613
Actual Offsetting Collections (-)	(1)	(1)	—	(2)	(281)	(2,375)
Change in Uncollected Customer Payments from Federal Sources	—	1	—	—	9	(467)
Anticipated Offsetting Collections	—	—	—	—	—	—
Budget Authority, Net	**38**	**—**	**548**	**495**	**—**	**17,771**
Outlays, Gross	38	45	242	383	246	19,562
Actual Offsetting Collections (-)	(1)	(1)	—	(2)	(281)	(2,375)
Outlays, Net	37	44	242	381	(35)	17,187
Distributed Offsetting Receipts (-)	—	—	—	—	3	3
Agency Outlays, Net	**$ 37**	**$ 44**	**$ 242**	**$ 381**	**$ (32)**	**$ 17,190**

Deferred Maintenance and Repairs
For the Fiscal Years 2013 and 2012

Deferred maintenance and repairs are maintenance and repair activities not performed when they should have been or were scheduled to be and which, therefore, are put off or delayed for a future period. NASA's buildings, facilities and other structures which include heritage assets remain in fair to good condition. Heritage assets support NASA's mission and enhance the public's understanding of NASA's numerous programs.

NASA uses a Deferred Maintenance parametric estimating method (DM method) in order to conduct a consistent condition assessment of its facilities, buildings and other structures (including heritage assets). This method measures NASA's current real property asset condition and documents real property deterioration. The DM method produces both a cost estimate of deferred maintenance and repairs, and a Facility Condition Index (FCI). Both measures are indicators of the overall condition of NASA's facilities. The facilities condition assessment methodology involves an independent, rapid visual assessment of nine different systems within each facility to include: structure, roof, exterior, interior finishes, HVAC, electrical, plumbing, conveyance, and program support equipment. The DM method is designed for application to a large population of facilities; results are not necessarily applicable for individual facilities or small populations of facilities. Under this methodology, NASA defines acceptable operating conditions in accordance with standards comparable to those used in private industry and the aerospace industry.

There has been no significant change in our deferred maintenance and repair estimate this year. The FCI is rated on a scale from 5 (excellent) to 1 (non-functional). The Agency-wide FCI, based on the ratings obtained during the condition assessment site visits, remains unchanged from the previous fiscal year. The FCI values for the majority of individual Centers and sites varied less than 0.5, validating the relative stability of the Centers and sites despite the continued aging and deterioration of older facilities. Evaluation of the facility conditions by building type (Real Property Classification Code/ DM Category) indicates that the Agency continues to focus maintenance and repair on direct mission-related facilities. Higher condition ratings are reported for Launch Facilities, potable water facilities, launch, communication, tracking, and fuel facilities Agency-wide. Lower condition ratings occur for infrastructure, site related systems, and static test stands.

Deferred Maintenance Method	2013	2012
Facility Condition Index (FCI)	3.7	3.7
Target Facility Index	3.8	3.8
Deferred Maintenance Estimate (Active and Inactive Assets) *(In Millions of Dollars)*	$ 2,295	$ 2,330

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National Aeronautics and Space Administration
Office of Inspector General
Washington, DC 20546-0001

December 6, 2013

TO: Charles F. Bolden, Jr.
Administrator

Elizabeth Robinson
Chief Financial Officer

FROM: Paul K. Martin
Inspector General

SUBJECT: Audit of the National Aeronautics and Space Administration's Fiscal Year 2013 Financial Statements (Report No. IG-14-006; Assignment No. A-13-006-00)

The Office of Inspector General contracted with the independent public accounting firm PricewaterhouseCoopers LLP (PwC) to audit NASA's financial statements in accordance with the Government Accountability Office's *Government Auditing Standards* and the Office of Management and Budget's Bulletin No. 14-02, "Audit Requirements for Federal Financial Statements."

The audit resulted in an unmodified opinion on NASA's fiscal year (FY) 2013 financial statements (Enclosure 1). An unmodified opinion means that the financial statements present fairly, in all material respects, the financial position and the results of the entity's operations in conformity with U.S. generally accepted accounting principles.

PwC also issued reports on internal control and compliance with laws and regulations (Enclosures 2 and 3, respectively). PwC reported no material weaknesses or significant deficiencies in internal control. In FY 2013, NASA resolved its sole remaining significant deficiency from prior years related to environmental liability estimation. During the audit, PwC also identified no instances of significant noncompliance with applicable laws and regulations.

In fulfilling our responsibilities under the Chief Financial Officers Act of 1990, we monitored the progress of the audit, reviewed PwC's reports and related documentation, inquired of PwC's representatives, and ensured that PwC met contractual requirements. Our review was not intended to enable us to express, and we do not express, an opinion on NASA's financial statements; conclusions about the effectiveness of internal controls over financial reporting; or compliance with certain laws and regulations, including but not limited to the Federal Financial Management Improvement Act of 1996.

PwC is responsible for each of the enclosed reports and the conclusions expressed therein. Our review disclosed no instances where PwC did not comply in all material respects with the Government Accountability Office's *Government Auditing Standards.*

Please contact us if you have any questions about the three enclosed reports.

Enclosures

Independent Auditor's Report

To the Administrator and the Inspector General
of the National Aeronautics and Space Administration

Report on the Financial Statements

We have audited the accompanying financial statements of the National Aeronautics and Space Administration (NASA) which comprise the consolidated balance sheets as of September 30, 2013 and September 30, 2012, and the related consolidated statements of net cost and changes in net position, and the combined statements of budgetary resources, and the related notes to the financial statements for the years then ended, which collectively comprise NASA's financial statements.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of the financial statements in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

Our responsibility is to express an opinion on the financial statements based on our audits. We conducted our audits in accordance with auditing standards generally accepted in the United States of America, the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States, and Office of Management and Budget (OMB) Bulletin No. 14-02, *Audit Requirements for Federal Financial Statements*. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on our judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, we consider internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

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Opinion

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of NASA as of September 30, 2013 and September 30, 2012, and its net cost, changes in net position and budgetary resources for the years then ended, in accordance with accounting principles generally accepted in the United States of America.

Other Matters

Required Supplementary Information

Accounting principles generally accepted in the United States of America require that the accompanying Management's Discussion and Analysis (MD&A) on pages 1 -70, Required Supplementary Information (RSI) on pages 103 - 107, and Required Supplementary Stewardship Information (RSSI) on pages 99 - 102 be presented to supplement the basic financial statements. Such information, although not a part of the basic financial statements, is required by the Federal Accounting Standards Advisory Board and OMB Circular A-136, *Financial Reporting Requirements*, who considers it to be an essential part of financial reporting for placing the basic financial statements in the appropriate operational, economic, or historical context. We have applied certain limited procedures to the required supplementary information in accordance with auditing standards generally accepted in the United States of America, which consisted of inquiries of management about the methods of preparing the information and comparing the information for consistency with management's responses to our inquiries, the basic financial statements, and other knowledge we have obtained during our audit of the basic financial statements. We do not express an opinion or provide any assurance on the information because the limited procedures do not provide us with sufficient evidence to express an opinion or provide any assurance.

Other Information

Our audit was conducted for the purpose of forming an opinion on the financial statements as a whole. The Message from the Administrator on page i, CFO Letter on page 47, Looking Forward on page 73, and Other Information on pages 119 - 173 is presented for purposes of additional analysis and is not a required part of the financial statements. Such information has not been subjected to the auditing procedures applied in the audit of the financial statements and, accordingly, we do not express an opinion or provide any assurance on the information.

Other Reporting Required by *Government Auditing Standards*

In accordance with *Government Auditing Standards*, we have also issued our report dated December 6, 2013 on our consideration of NASA's internal control over financial reporting and our report dated December 6, 2013, on its compliance and other matters for the year ended September 30, 2013. The purpose of those reports is to describe the scope of our testing of internal control over financial reporting and compliance and the results of that testing, and not to provide an opinion on the internal control over financial reporting or on compliance. Those reports are an integral part of an audit performed in accordance with *Government Auditing Standards* in considering NASA's internal control over financial reporting and compliance.

PricewaterhouseCoopers LLP

McLean, VA
December 6, 2013

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Independent Auditor's Report on Internal Control Over Financial Reporting Based on an Audit of Financial Statements Performed in Accordance with *Government Auditing Standards*

To the Administrator and Inspector General
of the National Aeronautics and Space Administration

We have audited, in accordance with auditing standards generally accepted in the United States of America, the standards applicable to financial audits contained in *Government Auditing Standards,* issued by the Comptroller General of the United States, and Office of Management and Budget (OMB) Bulletin No. 14-02, *Audit Requirements for Federal Financial Statements,* the financial statements of the National Aeronautics and Space Administration (NASA), which comprise the consolidated balance sheet as of September 30, 2013, and the related consolidated statements of net cost and changes in net position, and the combined statement of budgetary resources and the related notes to the financial statements for the year then ended, which collectively comprise NASA's financial statements, and have issued our report thereon dated December 6, 2013.

Internal Control Over Financial Reporting

In planning and performing our audit of the financial statements, we considered NASA's internal control over financial reporting ("internal control") to determine the audit procedures that are appropriate in the circumstances for the purpose of expressing our opinion on the financial statements, but not for the purpose of expressing an opinion on the effectiveness of NASA's internal control. Accordingly, we do not express an opinion on the effectiveness of NASA's internal control.

We limited our control testing to those controls necessary to achieve the following OMB control objectives that provide reasonable, but not absolute assurance, that: (1) transactions are properly recorded, processed, and summarized to permit the preparation of the financial statements in accordance with accounting principles generally accepted in the United States of America, and assets are safeguarded against loss from unauthorized acquisition, use, or disposition; and (2) transactions are executed in compliance with laws governing the use of budget authority, government-wide policies and laws identified in Appendix E of OMB Bulletin No. 14-02, and other laws and regulations that could have a direct and material effect on the financial statements.

We did not test all internal controls relevant to the operating objectives broadly defined by the Federal Managers' Financial Integrity Act of 1982.

A *deficiency* in internal control exists when the design or operation of a control does not allow management or employees, in the normal course of performing their assigned functions, to prevent, or detect and correct misstatements on a timely basis. A *material weakness* is a deficiency, or a combination of deficiencies, in internal control, such that there is a reasonable possibility that a material misstatement of the entity's financial statements will not be prevented,

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or detected and corrected on a timely basis. A *significant deficiency* is a deficiency or a combination of deficiencies in internal control that is less severe than a material weakness, yet important enough to merit attention by those charged with governance.

Our consideration of internal control was for the limited purpose described in the first paragraph of this section and was not designed to identify all deficiencies in internal control that might be material weaknesses or significant deficiencies. Given these limitations, during our audit we did not identify any deficiencies in internal control that we consider to be material weaknesses. However, material weaknesses may exist that have not been identified.

Purpose of this Report

The purpose of this report is solely to describe the scope of our testing of internal control and the results of that testing, and not to provide an opinion on the effectiveness of the entity's internal control. This report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering the entity's internal control. Accordingly, this communication is not suitable for any other purpose.

PricewaterhouseCoopers LLP

McLean, VA
December 6, 2013

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Independent Auditor's Report on Compliance and Other Matters Based on an Audit of Financial Statements Performed in Accordance with *Government Auditing Standards*

To the Administrator and the Inspector General
of the National Aeronautics and Space Administration

We have audited, in accordance with auditing standards generally accepted in the United States of America, the standards applicable to financial audits contained in *Government Auditing Standards,* issued by the Comptroller General of the United States, and Office of Management and Budget (OMB) Bulletin No. 14-02, *Audit Requirements for Federal Financial Statements*, the financial statements of the National Aeronautics and Space Administration (NASA), which comprise the consolidated balance sheet as of September 30, 2013, and the related consolidated statements of net cost and changes in net position, and the combined statement of budgetary resources and the related notes to the financial statements for the year then ended, and have issued our report thereon dated December 6, 2013.

Compliance and Other Matters

As part of obtaining reasonable assurance about whether NASA's financial statements are free from material misstatement, we performed tests of its compliance with certain provisions of laws and regulations, including laws governing the use of budgetary authority, government-wide policies and laws identified in Appendix E of OMB Bulletin No. 14-02 and other laws and regulations, noncompliance with which could have a direct and material effect on the determination of financial statement amounts. Under the Federal Financial Management Improvement Act of 1996 (FFMIA), we are required to report whether NASA's financial management systems substantially comply with the Federal financial management systems requirements, applicable Federal accounting standards, and the United States Government Standard General Ledger at the transaction level. To meet this requirement, we performed tests of compliance with FFMIA section 803(a) requirements.

We limited our tests of compliance to the provisions of the laws and regulations cited above; however providing an opinion on compliance with those provisions was not an objective of our audit and, accordingly, we do not express such an opinion.

The results of our tests of compliance disclosed no instances of noncompliance or other matters that are required to be reported under *Government Auditing Standards* or OMB Bulletin No. 14-02 and no instances of substantial noncompliance that are required to be reported under FFMIA.

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Purpose of this Report

The purpose of this report is solely to describe the scope of our testing of compliance and the results of that testing, and not to provide an opinion on compliance. This report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering the entity's compliance. Accordingly, this communication is not suitable for any other purpose.

PricewaterhouseCoopers LLP

McLean, VA
December 6, 2013

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Other Information

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Image Caption: The Pegasus rocket carrying the Interface Region Imaging Spectrograph (IRIS) satellite ignites its engine. (Credit: NASA)

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National Aeronautics and Space Administration

Office of Inspector General
Washington, DC 20546-0001

December 2, 2013

TO: Charles F. Bolden, Jr.
Administrator

FROM: Paul K. Martin
Inspector General

SUBJECT: 2013 Report on NASA's Top Management and Performance Challenges

As required by the Reports Consolidation Act of 2000, this memorandum provides our views of the top management and performance challenges facing NASA for inclusion in the Agency's fiscal year (FY) 2013 Performance and Accountability Report.

In deciding whether to identify an issue as a top challenge, we consider its significance in relation to the Agency's mission; its susceptibility to fraud, waste, and abuse; whether the underlying causes are systemic in nature; and the Agency's progress in addressing the challenge. We previously provided a draft copy of our views to NASA officials and considered all comments received when finalizing this report.

Looking forward to 2014, we identified the following as the top management and performance challenges facing NASA:

- Considering Whether to Further Extend the Life of the International Space Station
- Developing the Space Launch System and Its Component Programs
- Securing Commercial Crew Transportation Services
- Maintaining Cost and Schedule for the James Webb Space Telescope
- Ensuring Continued Efficacy of the Space Communications Networks
- Overhauling NASA's Information Technology Governance Structure
- Ensuring the Security of NASA's Information Technology Systems
- Managing NASA's Infrastructure and Facilities
- Ensuring the Integrity of the Contracting and Grants Processes

Similar to last year, we noted that declining budgets and fiscal uncertainties have compounded the difficulty of meeting these and other NASA challenges. Finally, during FY 2014 the OIG will conduct audit and investigative work that focuses on NASA's continuing efforts to meet these challenges. Please contact us if you have questions.

Enclosure

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cc:
Administrator/Mr. Bolden
Associate Administrator/Mr. Lightfoot
- Deputy Associate Administrator/Ms. Roe

Chief of Staff/Mr. Radzanowski
- Director for Office of Evaluation/Ms. Grant (Acting)

Associate Deputy Administrator/Mr. Keegan
Associate Deputy Administrator for Strategy and Policy/Dr. Keiser
Assistant Associate Administrator/Mr. Maples (Acting)
Deputy Chief of Staff/Mr. French
White House Liaison/Mr. Herczeg
Chief Financial Officer/Dr. Robinson
Chief Information Officer/Mr. Sweet
Chief Engineer/Dr. Ryschkewitsch
Chief Health and Medical Officer/Dr. Williams
Chief Safety and Mission Assurance/Mr. Wilcutt
Chief Scientist/Dr. Stofan
Chief Technologist/Dr. Peck
General Counsel/Mr. Wholley
Inspector General/Mr. Martin
Associate Administrator for Communications/Mr. Weaver
Associate Administrator for Diversity and Equal Opportunity/Ms. Manuel
Associate Administrator for Education/Mr. Melvin
Associate Administrator for International and Interagency Relations/Mr. O'Brien
Associate Administrator for Legislative and Intergovernmental Affairs/Mr. Statler
Associate Administrator for Small Business Programs/Mr. Delgado
Associate Administrator for Aeronautics Research Mission Directorate/Dr. Shin
Associate Administrator for Human Exploration and Operations Mission Directorate/ Mr. Gerstenmaier
Associate Administrator for Science Mission Directorate/Dr. Grunsfeld
Associate Administrator for Space Technology Mission Directorate/Dr. Gazarik
Associate Administrator for Mission Support Directorate/Mr. Keegan
- Assistant Administrator for Human Capital Management/Ms. Buchholz
- Assistant Administrator for Procurement/Mr. McNally
- Assistant Administrator for Protective Services/Mr. Mahaley
- Assistant Administrator for Strategic Infrastructure/Ms. Dominguez
- Director, Internal Controls and Management Systems/Ms. Baugher
- Director, NASA Management Office/Mr. Watkins
- Executive Director, Headquarters Operations/Mr. Henn
- Executive Director, NSSC/Mr. Smith

3

Directors, NASA Centers

Ames Research Center/Dr. Worden
Dryden Flight Research Center/Mr. McBride
Glenn Research Center/Mr. Free
Goddard Space Flight Center/Mr. Scolese
Jet Propulsion Laboratory/Dr. Elachi
Johnson Space Center/Dr. Ochoa
Kennedy Space Center/Mr. Cabana
Langley Research Center/Mr. Jurczyk (Acting)
Marshall Space Flight Center/Mr. Scheuermann
Stennis Space Center/Dr. Gilbrech

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NASA's Top Management and Performance Challenges
November 2013

Introduction

During the past fiscal year (FY), NASA's rover Curiosity explored the surface of Mars and celebrated the 1-year anniversary of its landing on the Red Planet; six NASA astronauts traveled to and from the International Space Station (ISS or Station); and the Agency continued to work with commercial partners Space Exploration Technologies Corporation (SpaceX), Orbital Sciences Corporation (Orbital), The Boeing Company (Boeing), and Sierra Nevada Corporation (Sierra Nevada) to develop cargo and crew transportation systems that would end the Agency's reliance on Russian and other international spacecraft. SpaceX made cargo deliveries to the ISS in October 2012 and March 2013 and Orbital flew a demonstration mission of its cargo delivery system to the Station in September 2013.

However, the Agency also faced a series of significant programmatic and budgetary challenges. Along with the rest of the Federal Government, NASA began FY 2013 under a 6-month continuing resolution that funded the Agency at FY 2012 levels. This was followed by a budget for the remainder of the fiscal year that reduced the Agency's enacted funding level of $17.5 billion by $626.5 million, or approximately 4 percent due to sequestration.

These financial pressures look to repeat themselves in FY 2014, with no annual budget in place at the beginning of the fiscal year and potential sequestration impacts that could reduce NASA's budget request of $17.7 billion by $1.5 billion to $16.2 billion. As the National Research Council noted in its 2012 report examining NASA's strategic direction and management, NASA's budget is "mismatched to the current portfolio of missions, facilities, and staff."[1] Accordingly, the principal challenge currently facing NASA leaders is to effectively manage the Agency's varied programs in this austere and uncertain budget environment.

In addition to this overarching challenge, NASA managers will continue to grapple with a myriad of individual Agency, project, and facility-related issues. This document identifies what we believe to be the top challenges facing the Agency in FY 2014:

1. Considering Whether to Further Extend the Life of the International Space Station
2. Developing the Space Launch System and Its Component Programs
3. Securing Commercial Crew Transportation Services
4. Maintaining Cost and Schedule for the James Webb Space Telescope
5. Ensuring Continued Efficacy of the Space Communications Networks
6. Overhauling NASA's Information Technology Governance Structure
7. Ensuring the Security of NASA's Information Technology Systems
8. Managing NASA's Infrastructure and Facilities
9. Ensuring the Integrity of the Contracting and Grants Processes

[1] National Research Council, "NASA's Strategic Direction and the Need for a National Consensus" (2012).

In deciding whether to identify an issue as a top challenge, we considered the significance of the issue in relation to the Agency's mission; its susceptibility to fraud, waste, and abuse; whether the underlying causes are systemic in nature; and the Agency's progress in addressing the challenge. We have not ranked the challenges summarized below in priority order.

1. Considering Whether to Further Extend the Life of the International Space Station

In the mid-1980s, the United States began negotiating with the Canadian, Japanese, and European space agencies to build and operate a space station in low Earth orbit, and the Russians joined the effort in 1993. Assembly of the ISS began in 1998 and was completed in 2011, with NASA expending approximately $100 billion ($60 billion for construction and $40 billion for associated Space Shuttle flights). Originally slated to be decommissioned in 2015, NASA requested and Congress authorized extending the life of the Station to 2020, and NASA's international partners agreed to support ISS operations and utilization until then. As this deadline approaches, NASA is once again facing the question of whether to request that Congress extend the life of the Station, this time to 2028.

As part of its effort to extend ISS operations to 2020, NASA contracted with Boeing, the primary contractor for the ISS, to determine which ISS subsystems required servicing or upgrading in order to maintain the Station for another 5 years. Although a Boeing representative recently stated that this study did not reveal any major structural issues that would prevent ISS operation beyond 2020, deciding whether to extend the life of the ISS another 8 years requires further study by both NASA and its partners. For their part, Russian engineers believe the Zarya cargo module, the oldest pressurized module on the Station, can last in orbit until about 2028 – twice its design service life.

The ISS currently costs approximately $3 billion a year to operate. Extending the Station beyond 2020 would likely require NASA to invest additional funds to service the structure and update its equipment. Consequently, some space policy experts have expressed concern that NASA will not have enough money to make the required upgrades and operate the Station while concurrently developing the Agency's other human exploration programs, including the Space Launch System (SLS) and the Orion Multi-Purpose Crew Vehicle (MPCV). At the same time, NASA needs to gauge the interest and ability of its international partners to assist in extending ISS operations another 8 years.

Given the high costs and extraordinary effort to build the ISS, national leaders have emphasized the importance of maximizing its scientific research capabilities. NASA's current research aboard the ISS focuses on life and physical sciences, human research, exploration research and technology development, astrophysics, heliophysics, and planetary and Earth science. In addition to NASA-directed research, other Federal agencies, research scientists, and commercial companies have conducted research on the ISS in fields such as cancer treatment delivery systems and vaccine development.

In 2013, NASA's Office of Inspector General (OIG) examined NASA's efforts to maximize research on the ISS and found that although NASA has made progress towards maximizing the

Station's research capabilities, opportunities exist for greater utilization.[2] In this report, we found that NASA has generally increased the level of activity for each of the three metrics it uses to assess utilization of ISS research capabilities: average weekly crew time, number of investigations, and use of allocated space. However, further progress depends on the ability of the Center for the Advancement of Science in Space, Inc. (CASIS), the nonprofit organization NASA contracted to manage non-NASA research on the Station, to attract private funding and encourage companies and other organizations to conduct self-funded research. Maximizing these capabilities also relies on the success of the Agency's Commercial Cargo and Crew Programs.

In August 2011, NASA signed a cooperative agreement with CASIS to manage non-NASA research on the ISS. Pursuant to the agreement, NASA provides CASIS $15 million annually to fund non-NASA research proposals. CASIS is expected to supplement these funds by raising additional money and to encourage companies and other organizations to conduct self-funded research on the Station. However, attracting private funding, matching investors with researchers, and fostering a market to conduct non-NASA research on the Station is difficult given that historically NASA has received little interest from private entities to conduct research on the ISS absent a substantial infusion of Government funds.

NASA's Commercial Cargo Program is essential to ensuring the capacity to ferry experiments and supplies to and from the Station and the vehicles currently under development as part of NASA's Commercial Crew Program are expected to make it possible to staff the ISS with a full complement of seven crew members (rather than the current six), thereby increasing the amount of crew time available for research. According to the ISS Program Office, a seventh crew member could add an average of 33 hours per week of crew research time – a 94 percent increase over current rates.

Conversely, if the operational life of the Station is not extended, commercial providers may be left without a Government market for their transportation systems. As discussed below, NASA's goal is to secure transportation for its astronauts to the ISS from a commercial company by 2017, and currently NASA is the only customer for these services. Even if commercial flights begin that year, absent an extension of the ISS beyond 2020, commercial companies will have relatively few opportunities to carry NASA crews to the Station.

The OIG initiated an audit in September 2013 to assess NASA's examination of the issues surrounding possible extension of the ISS beyond 2020.

2. Developing the Space Launch System and Its Component Programs

In April 2013, NASA announced plans for a mission to identify, capture, and relocate an asteroid while emphasizing that Mars is its ultimate destination for beyond low Earth orbit human exploration. However, some members of Congress advocate landing on the Moon as a precursor to a Mars mission. Whatever the destination, successful development of NASA's new "heavy

[2] NASA OIG, "NASA's Efforts to Maximize Research on the International Space Station" (IG-13-019, July 8, 2013).

lift" rocket – the SLS – and accompanying MPCV capsule are critical to the overall success of NASA's current human exploration goals.

The NASA Authorization Act of 2010 set a goal for NASA to achieve operational capability for the SLS and MPCV by December 31, 2016. NASA has reported that it will not meet this timetable and instead plans to launch an uncrewed test flight of the SLS and MPCV in 2017 followed by a crewed flight in 2021.

NASA is using the Space Shuttle's main engine – the RS-25 – on the SLS vehicle and designing it with an evolvable architecture that can be tailored to accommodate longer and more ambitious missions. Initial versions of the SLS will be capable of lifting 70-metric tons and use an interim cryogenic propulsion stage to propel the MPCV around the Moon on its first exploration mission. Later versions will be designed to lift 130-metric tons and incorporate an upper stage to travel to deep space.

The MPCV will be mounted atop the SLS and serve as the crew vehicle for up to six astronauts on missions beyond low Earth orbit. NASA is developing the MPCV using an existing contract with Lockheed Martin Corporation and is basing its design on requirements for the Orion Crew Exploration Vehicle that was part of NASA's defunct Constellation Program.

In addition to the SLS and MPCV, NASA's Ground Systems Development and Operations (GSDO) Program is modifying launch infrastructure at Kennedy Space Center formerly used for the Space Shuttle. The GSDO Program is refurbishing the crawler-transporter that will transport the SLS from Kennedy's Vehicle Assembly Building to the launch pad and modifying the mobile launcher platform and tower (originally built for the Constellation Program's Ares I rocket), the Vehicle Assembly Building, and launch pad 39B to support the SLS. The OIG initiated an audit in August 2013 to evaluate NASA's management of its launch infrastructure modernization efforts, including work performed by the GSDO Program.

NASA's challenge in this area will be to concurrently develop a launch system and crew vehicle and modify the necessary supporting ground systems while meeting the Administrator's mandate that exploration systems be affordable, sustainable, and realistic. For example, integrating hardware and supporting equipment from other programs, specifically the Space Shuttle and Constellation, may prove challenging since each piece of equipment was designed and tested for a different launch vehicle. Moreover, achieving successful integration will require effective management of the Programs' integrated cost and schedule.

Looming over the daunting technical and schedule challenges for NASA's human exploration program is a foreboding budget scenario. For example, the MPCV Program anticipates receiving a flat budget of approximately $1 billion per year into the 2020s. Given this budget profile, NASA is using an incremental development approach under which it allocates funding to the most critical systems necessary to achieve the next development milestone rather than developing multiple systems simultaneously as is common in major spacecraft programs. Prior work by our office has shown that delaying critical development tasks increases the risk of future

cost and schedule problems.[3] Moreover, NASA Program officials admit that this incremental development approach is not ideal, but contend that it is the only feasible option given current funding levels. Although we believe MPCV Program officials are managing the Program as efficiently as they can within their constrained budget, we are concerned about the future of the Program given the risks associated with incremental development.

Similarly, the Government Accountability Office (GAO) reported in its 2013 assessment of major NASA programs that the SLS Program has had to make adjustments to its development schedule to stay within its short-term funding projections.[4] Specifically, the Program has deferred work on the 130-metric ton vehicle until sufficient funding becomes available. At the same time, NASA may need to modify Space Shuttle heritage hardware such as the RS-25 main engines in order to meet performance requirements for the SLS. In addition, the Program is working to determine what human rating requirements will be required for the SLS and whether the existing SLS design will meet those requirements.

Even after the SLS and MPCV are fully developed and ready to transport crew, NASA will continue to face significant challenges concerning the long-term sustainability of its human exploration program. For example, unless NASA begins a program to develop landers and surface systems, NASA astronauts will be limited to orbital missions. In the current budget environment, however, it appears unlikely that NASA will obtain significant funding to begin development of this additional exploration hardware anytime soon, delaying such development into the 2020s. Given the time and money necessary to develop landers and associated systems, it is unlikely that NASA would be able to conduct any manned surface exploration missions until the late 2020s at the earliest.

3. Securing Commercial Crew Transportation Services

Since the conclusion of the Space Shuttle Program in July 2011, the United States has lacked a domestic capability to transport crew and, until recently, cargo to and from the ISS. Consequently, NASA has relied on a series of barter agreements with Japanese and European partners to transport cargo to the Station and the Russian Soyuz program to transport its astronauts. Between 2012 and 2017, NASA is scheduled to pay Russia $1.7 billion to ferry 30 NASA astronauts and international partners to and from the ISS at prices ranging from $47 million to more than $70 million per round trip.

As discussed above, reliable cargo transportation to the ISS is essential to ensure that life-sustaining supplies can be delivered to support the Station's crews and to maximize its utilization as a research lab by delivering and returning experiment-related materials to Earth. Beginning in 2006, NASA entered into a series of Space Act Agreements with commercial partners to stimulate the U.S. industry's development of transportation systems capable of providing safe and reliable cargo and crew services to the ISS and low Earth orbit. NASA initiated two

[3] NASA OIG, "NASA's Challenges to Meeting Cost, Schedule, and Performance Goals" (IG-12-021, September 27, 2012), and "Status of NASA's Development of the Multi-Purpose Crew Vehicle" (IG-13-022, August 15, 2013).

[4] GAO, "NASA: Assessments of Selected Large-Scale Projects" (GAO-13-276SP, April 17, 2013).

activities to manage its investments in this area: the Commercial Orbital Transportation Services (COTS) Program and the Commercial Crew Program.

For the COTS Program, NASA collaborated with and provided funding to two companies –$396 million to SpaceX and up to $288 million to Orbital – to assist in their development of spaceflight cargo capabilities.[5] SpaceX flew successful resupply missions in October 2012 and March 2013 and has a $1.6 billion contract with NASA for a total of 12 resupply missions. Orbital flew its demonstration mission in September 2013, and is scheduled to undertake the first of eight resupply missions under its $1.9 billion contract as early as December 2013. These flights took place after multi-year delays for both companies' spacecraft.

As of August 31, 2013, NASA has spent $1.1 billion on its commercial crew development efforts. The Agency is currently working with three companies – Boeing, SpaceX, and Sierra Nevada – using a combination of funded Space Act Agreements and more traditional contracts based on the Federal Acquisition Regulation (FAR) to develop commercial crew transportation capabilities. NASA's goal is to secure commercial transportation for its astronauts to the ISS by 2017. As of August 31, 2013, the Agency has provided $416 million to Boeing, $328 million to SpaceX, and $229 million to Sierra Nevada to work toward this goal. A fourth company, Blue Origin, is also conducting development work under an unfunded Space Act Agreement with the Agency.

NASA's Commercial Crew Program is entering a critical stage in its development with Boeing, SpaceX, and Sierra Nevada expected to complete their spacecraft designs within the next year. While the partners are responsible for developing the vehicles, they rely heavily on NASA funding. At the same time, NASA maintains responsibility for ensuring that the partners' launch systems, spacecraft, and related ground support will meet Agency safety and operational requirements. All three partners successfully achieved a state of maturity approximate to a Preliminary Design Review prior to NASA's award of the latest round of Space Act Agreements in 2012, and have set an optimistic schedule for achieving what amounts to a Critical Design Review of their systems by mid-2014.[6]

After completion of the initial two rounds of development using funded Space Act agreements, NASA originally planned a two-phased, FAR-based acquisition approach to develop commercial crew capabilities. Phase 1 was to consist of firm-fixed-price contracts to multiple companies for integrated design and early development to be followed by a second round of firm-fixed-price contracts for additional development, testing, evaluation, and certification of the contractors' crew transportation systems. Thereafter, NASA planned to enter into individual FAR-based contracts for each service provider. However, for FY 2012, NASA received $397 million for its

[5] Rocketplane Kistler also received $32.1 million in funding from NASA, but was terminated from COTS in 2007 after failing to meet financial and technical milestones.

[6] Each company defined its own requirements for achieving Preliminary and Critical Design Reviews that were then negotiated with NASA before the Space Act Agreements were awarded. NASA defines a Preliminary Design Review as establishing the basis for proceeding with detailed design and demonstrates that the correct design option was selected, interfaces have been identified, and verification methods have been described. The Critical Design Review determines if the integrated design is appropriately mature to continue with final design and fabrication. Both reviews are important to demonstrate that a system meets all requirements with acceptable risk and within cost and schedule constraints. NASA funded Boeing and SpaceX to achieve a Critical Design Review, but due to its limited budget has not funded Sierra Nevada's completion of that milestone.

commercial crew program, less than half its $850 million request. In light of this development, early in 2012 NASA revised its commercial crew acquisition strategy and has relied on funded Space Act Agreements rather than FAR-based contracts for the integrated design phase of the Program. The funding cuts have also resulted in NASA delaying the expected completion of the commercial crew development phase from 2016 to 2017.

NASA's use of funded Space Act Agreements rather than FAR-based contracts to develop new transportation capabilities has several potential benefits. First, because the partners share development costs and the agreements involve fewer regulations and require less oversight by NASA, there may be a reduction in the Agency's cost of acquiring these capabilities. Second, because NASA does not impose specific requirements on the companies as part of the agreements, the commercial partners are free to develop spacecraft designs that will support the needs of both NASA and other potential customers. Third, NASA officials said they believe the greater flexibility offered by Space Act Agreements promotes creativity and innovation.

However, NASA's use of Space Act Agreements also poses risks, most prominently limiting NASA's ability to dictate specific design and safety requirements during the development process. In addition, oversight of partners in a Space Act Agreement relationship is challenging because the Agreements do not allow NASA to place specific requirements on the companies. Taken together, these constraints make it harder to ensure that the companies will ultimately produce spaceflight systems that meet Agency requirements and that NASA can be confident of their ability to safely carry its astronauts to and from the ISS. To mitigate these concerns, in December 2011 NASA published baseline documents identifying the requirements and certification process for commercial transportation systems. A year later, NASA began the certification process by awarding Boeing, SpaceX, and Sierra Nevada FAR-based contracts that require them to submit key documents for NASA's review and approval.

In a November 2013 audit, we identified four challenges to NASA's commercial crew development program: (1) unstable funding; (2) integration of cost estimates with the Program schedule; (3) challenges in providing timely requirement and certification guidance; and (4) spaceflight coordination issues with other Federal agencies.[7]

For the past several years, the Commercial Crew Program has received significantly less funding than NASA requested. The reduction in funds has resulted in delays of the expected completion of the commercial crew development phase until 2017 – only 3 years before the currently scheduled end of ISS operations. Further, experience has shown that reducing funding profiles when an increase in funding is required could result in cost increases, schedule delays, and performance problems later in a program's development.

Moreover, NASA has yet to project the total amount of funding required by year, which makes it difficult for NASA to manage its wider portfolio of spaceflight programs and reduces the transparency of the Program's budget submissions. Further, the process for providing timely guidance to partners for satisfying NASA's human rating and certification requirements could be improved. If NASA is unable to confirm design requirements and provide certification guidance in a timely manner, the companies could face costly and time-consuming redesign work late in

[7] NASA OIG, "NASA's Management of the Commercial Crew Program" (IG-14-001, November 13, 2013).

system development. Finally, coordination of important safety issues with the Federal Aviation Administration (FAA) and the U.S. Air Force is progressing, but has yet to be fully resolved. Resolution of issues such as approval processes for in-flight changes and reentry and emergency diversions require formal agreement between NASA, the FAA, and the Air Force.

Failure to resolve the challenges facing NASA's Commercial Crew Program could significantly delay the availability of commercial transportation services and extend U.S. reliance on the Russians for crew transportation to the ISS.

4. Ensuring Continued Efficacy of the Space Communications Network

NASA's Space Communications and Navigation (SCaN) Program is responsible for providing communications, navigation, and delivery of scientific data to space flight missions. SCaN is comprised of three networks: (1) the Near Earth Network, which covers low Earth orbit and portions of geosynchronous orbit; (2) the Space Network, which controls the Tracking and Data Relay Satellites (TDRS) through a network of geographically diverse ground systems; and (3) the Deep Space Network, which covers NASA mission needs beyond geosynchronous orbit.[8] Without SCaN services, NASA could not receive data transmission from its satellites and robotic missions or control such missions from Earth, and space hardware worth tens of billions of dollars would be little more than orbital debris. While NASA has provided these services for over 30 years, many of its current satellite communications systems are aging and increasingly difficult to repair.

In 2006, NASA initiated the SCaN Program to create an integrated Agency-wide space communications and navigation architecture. The evolution of the integrated system will take place in phases. With a planned FY 2014 budget of $554 million, the Near Earth, Space, and Deep Space Networks initially will remain independent. In the interim, SCaN is adding new capabilities that extend the functionality of the networks and will be incorporated into the integrated architecture. SCaN also manages the Spectrum Program for the Agency and is deeply involved in this issue with other space-faring nations. The Spectrum Management Program ensures that all NASA activities comply with national and international laws applicable to the use of the electromagnetic spectrum.

NASA has plans to upgrade its Space Network through an $860 million Space Network Ground Segment Sustainment (SGSS) Project. The purpose of the SGSS Project is to implement a modern ground station that will enable delivery of high quality services to the Space Network community while significantly reducing operations and maintenance costs. Without the upgrades, the ground system will become increasingly unreliable and more expensive to maintain. To complement the ground station, NASA maintains the TDRS fleet of satellites that transmit the tracking, data, voice, and video services from the ground station to the ISS, NASA's space and Earth science missions, other Federal agencies, and commercial users. The Space Network is in the process of upgrading and replenishing failing TDRS, many of which are operating well beyond their planned lives. The TDRS replenishment efforts are major components of maintaining Space Network capabilities.

[8] A geosynchronous orbit is one in which a satellite is always in the same position with respect to the rotating Earth.

NASA is also upgrading the Deep Space Network. The Deep Space Network was established in 1963 to provide communications for all of NASA's robotic missions outside of Earth orbit, international spacecraft, as well as scientific investigations through radio astronomy, radio science, and radar activities. The Deep Space Network is run from three ground-based sites (Goldstone, California; Madrid, Spain; and Canberra, Australia) with one 70-meter antenna and multiple 34-meter antennas at each location for around-the-clock coverage. As part of the upgrade NASA will replace the aged 70-meter antennas at all three Deep Space Network sites with arrays of new 34-meter antennas by 2025 at an estimated cost of $369 million. The upgrades will support a greater number of missions and spacecraft as well as the increased complexity and data transfer requirements of those missions. For example, NASA projects that future deep space missions will require much faster data transmission than the current system can provide and that future robotic missions will require more precise spacecraft navigation for entry, descent, landing, and outer planet explorations, as well as to support manned missions to Mars.

The OIG is examining the SCaN Program through a series of audits, the first of which will focus on the Space Network to assess how NASA is identifying and adjusting capabilities to meet mission requirements; managing program, cost, schedule, and performance; and addressing key risks facing the Project. Future audits will examine the Deep Space Network, Near Earth Network, and Spectrum Management, and conclude with a capping report on the entire SCaN Program.

5. Maintaining Cost and Schedule for the James Webb Space Telescope

The James Webb Space Telescope (JWST) – the successor to the Hubble Space Telescope – is anticipated to be the premier space-based observatory of the next decade. The telescope is designed to help understand the origin of the universe, the evolution of stars, and the formation of our solar system. JWST consists of a 25-square-meter mirror composed of 18 smaller mirrors, an integrated science instrument module that houses the telescope's 4 instruments, and a tennis court size sunshield. JWST's instruments are designed to work primarily in the infrared range of the electromagnetic spectrum, allowing the telescope unprecedented detection capability. NASA plans to launch the telescope aboard a European Space Agency Ariane 5 rocket in October 2018.

Unlike Hubble, which orbits relatively close to Earth (570 kilometers) and was refurbished by NASA five times since its 1990 launch, JWST will be positioned 1.5 million kilometers from Earth at the second Lagrange point (L2) and therefore unserviceable should it malfunction (see Figure 1).[9]

[9] There are five Lagrange points where the gravitational forces and the orbital motion of the spacecraft, Sun, and Earth interact to create a gravitationally stable location. L2 is directly behind the Earth as viewed from the sun, approximately 1 million miles (1.5 million kilometers) away.

Figure 1. Hubble Space Telescope and JWST Relative to Earth

Source: http://www.jwst.nasa.gov/orbit.html.

Like many NASA projects, JWST faces challenges meeting cost, schedule, and performance goals. In September 2012, we identified the Agency's optimistic culture, a tendency to underestimate technical complexity, and funding instability as major drivers of cost and schedule growth for its projects, including JWST.[10] Late 1990s and early 2000s cost estimates for the JWST Program ranged from $1 billion to $3.5 billion, with expected launch dates between 2007 and 2011. However, following a change in the launch vehicle and revisions to other requirements, NASA estimated life-cycle costs in 2005 at $4.5 billion with a launch date in 2013. A year later, an independent review team reported that although the Program was technically sound, contingency funding reserves were too low, phased too late in development, and did not support the complexity of the Program. The review team also reported that a 2013 launch date was not achievable. In 2009, NASA baselined JWST with a life-cycle cost estimate of $4.96 billion and a June 2014 launch date.[11]

Unfortunately, it soon became clear that neither the baseline cost estimate nor the launch date were attainable. At the request of Congress, NASA commissioned another independent review, and in October 2010 the Independent Comprehensive Review Panel reported that while technical performance was "commendable and often excellent" the budget and contingency funding reserve was severely understated and improperly phased, Program management was ineffective, and the Program could not meet its baselined cost and schedule commitments.[12] Subsequently, NASA restructured the JWST Program and in November 2011 established a revised baseline life-cycle cost estimate of $8.8 billion and an October 2018 launch date.

Although JWST Program management has made significant progress in the past 2 years, including completion of all 18 primary mirror segments, significant challenges remain for the Program to meet its revised baseline. In December 2012, the GAO reported that the Program's cost estimate could be improved, schedule reserve for required test and integration activities was limited, and two of four instruments had yet to be delivered.[13] The other two instruments – the Near-InfraRed Spectrometer and the Near-InfraRed Camera – were completed and received in

[10] NASA OIG, "NASA's Challenges to Meeting Cost, Schedule, and Performance Goals" (IG-12-021, September 27, 2012).

[11] A baseline defines the requirements, costs, schedule, and performance parameters of an acquisition program, and identifies milestones for measuring the program's progress.

[12] Independent Comprehensive Review Panel, "James Webb Space Telescope (JWST) Independent Comprehensive Review Panel (ICRP): Final Report" (October 29, 2010).

[13] GAO, "James Webb Space Telescope: Actions Needed to Improve Cost Estimate and Oversight of Test and Integration" (GAO-13-4, December 3, 2012).

September 2013. Program managers have had to continuously adjust the testing schedule to accommodate these delivery delays.

In addition, NASA has identified additional challenges related to the Program's budget. For example, having spent more than anticipated in the past year to address several unanticipated technical challenges, the Program's contingency reserves are less than planned and Headquarters-level reserves for the Program are limited in FY 2014.

As we stated in our September 2012 report, historically NASA has taken funds from other programs when highly visible flagship missions experience significant cost growth. Because JWST is the largest science project in NASA's portfolio, any future budgetary and programmatic challenges will reverberate throughout the Agency.

6. Managing NASA's Infrastructure and Facilities

NASA is the ninth largest Federal Government property holder, controlling approximately 4,900 buildings and structures with an estimated replacement value of more than $30 billion. More than 80 percent of the Agency's facilities are 40 or more years old and beyond their design life. Under its current policy, NASA is required to maintain these facilities either in an operational status or, if they are not being used, in sufficient condition so they do not pose a safety hazard. However, NASA has not been able to fully fund required maintenance for its facilities over the years and in 2012 estimated its deferred maintenance costs at $2.3 billion. Moreover, a 2012 NASA study estimated that the Agency may have as many as 865 unneeded facilities with associated maintenance costs of more than $24 million annually.

The OIG has conducted 10 audits over the past 4 years examining various aspects of NASA's efforts to manage its aging infrastructure.[14] Most recently, in February 2013 we released a report assessing NASA's efforts to reduce unneeded infrastructure and facilities. In that review, we identified 33 facilities, including wind tunnels, test stands, thermal vacuum chambers, airfields, and launch infrastructure at NASA Centers across the country the Agency was not utilizing or for which NASA officials could not identify a future mission use. These facilities cost the Agency more than $43 million to maintain in FY 2011 alone.

Historically, we found that efforts by NASA to reduce its underutilized facilities have been hindered by four longstanding and interrelated factors: (1) fluctuating and uncertain strategic requirements; (2) Agency culture and business practices; (3) political pressure; and (4) inadequate funding. We concluded that the combination of these forces has frustrated NASA's efforts over the years to make meaningful reductions in the size of its real property

[14] NASA OIG, "NASA's Management of Energy Savings Contracts" (IG-13-014, April 8, 2013); "Review of NASA's Explosives Safety Program" (IG-13-013, March 27, 2013); "NASA's Environmental Remediation Efforts at the Santa Susana Field Laboratory" (IG-13-007, February 14, 2013); "NASA's Efforts to Reduce Unneeded Infrastructure and Facilities" (IG-13-008, February 12, 2013); "NASA's Plans to Modify the Ares I Mobile Launcher in Support of the Space Launch System" (IG-12-022, September 25, 2012); "NASA's Infrastructure and Facilities: An Assessment of the Agency's Real Property Leasing Practices" (IG-12-020, August 9, 2012); "NASA's Infrastructure and Facilities: An Assessment of the Agency's Real Property Master Planning" (IG-12-008, December 19, 2011); "NASA Infrastructure and Facilities: Assessment of Data Used to Manage Real Property Assets" (IG-11-024, August 4, 2011); "NASA's Hangar One Re-Siding Project" (IG-11-020, June 22, 2011); and "Audit of NASA's Facilities Maintenance" (IG-11-015, March 2, 2011).

portfolio. Moreover, without sustained commitment by top NASA leaders and the authority from Congress to make the 'tough calls" when it comes to what facilities to close or consolidate, meaningful downsizing of the Agency's infrastructure will continue to be elusive.

The 33 facilities include:

- *Wind Tunnels*: At least 6 of NASA's 36 wind tunnels were underutilized or not needed for future missions. NASA's use of wind tunnels has declined in recent years due to a reduction in the Agency's aeronautics budget, fewer new aircraft developments by the Department of Defense and private industry, newer and more capable foreign testing facilities, and the advent of alternative testing methods such as computational fluid dynamics.
- *Test Stands*: As many as 14 of the Agency's 35 rocket engine test stands were underutilized or not needed for future missions. NASA's use of test stands has declined in recent years primarily due to a lack of new, large-scale propulsion test programs. The ongoing development of the heavy-lift rocket associated with the SLS Program is not expected to alter this trend.
- *Thermal Vacuum Chambers*: At least 4 of the Agency's 40 large thermal vacuum chambers were underutilized or not needed for future missions. NASA's use of the chambers has declined in recent years due to a lack of need by NASA programs and the poor condition of some chambers.
- *Airfields*: Two of the Agency's three airfields – Moffett Federal Airfield at Ames and the Shuttle Landing Facility at Kennedy – were underutilized or not needed for future missions. Moffett almost exclusively supports non-NASA entities while the Kennedy facility supports non-NASA space hardware deliveries. The Kennedy airfield was last used for a NASA mission in September 2012 by the plane carrying Space Shuttle Endeavour to its final home at the California Science Center.
- *Launch Infrastructure*: Seven of NASA's launch-related facilities at Kennedy were underutilized or not needed for future missions. These include solid rocket booster recovery facilities, a parachute refurbishment facility, a launch pad, and one Orbiter Processing Facility. NASA's need for this infrastructure ended when the Space Shuttle Program phased out, and timely decisions on their future is needed in light of the high costs associated with continuing their maintenance. To their credit, Kennedy managers have leased one Orbiter Processing Facility and are seeking commercial companies to lease several other sites, including launch pad 39A.

While NASA officials agreed that these 33 facilities are unused or at best underused, the consensus breaks down when searching for a way forward. In our audit, we identified four interrelated challenges that historically have hindered NASA's ability to comprehensively address its infrastructure problems.

First, changes to the Nation's space policy initiated by Congress, the President, and NASA have increased the difficulty of determining which facilities the Agency needs to accomplish its mission. For example, NASA's human exploration mission has transitioned from the Space Shuttle Program to the Constellation Program to the SLS in just 6 years. Because decisions of

whether to retain, consolidate, or dispose of specific facilities depend heavily upon the missions NASA undertakes, frequent changes to those missions complicate the task of managing the Agency's infrastructure.

An example of this challenge is the Agency's experience with the A-3 test stand constructed at the Stennis Space Center to accommodate special testing requirements associated with NASA's Constellation Program. When Constellation was cancelled in 2010, the test stand was approximately 65 percent complete and NASA was directed by Congress to complete construction for at a total cost of nearly $350 million. However, because neither the SLS nor any planned NASA program requires the A-3's capabilities, NASA plans to mothball the test stand when construction is complete. At the time of our audit, NASA reported that the associated annual operations and maintenance costs of the mothballed stand could exceed $1.5 million.

Second, NASA has historically practiced a decentralized approach to managing its infrastructure that creates a rivalry between the Centers to compete for work from the Agency's major programs and rewards a "keep it in case you need it" philosophy. This culture has fostered a propensity for Centers to build or preserve facilities that duplicate capabilities available elsewhere in the Agency or lack an identified mission use. For example, NASA currently has 36 wind tunnels at 5 Centers, 35 rocket test stands at 6 sites, and 40 large thermal vacuum chambers at 7 locations.

Third, the political context in which NASA operates often impedes its efforts to reduce infrastructure. During our review, we noted several examples where political leaders intervened in plans to close or consolidate Agency facilities. For example, members of Congress opposed NASA's decision to consolidate the Agency's Arc Jet operations at Ames, directed completion of the A-3 test stand, and contested the Agency's decision to dispose of Hangar One. While input from Federal, state, and local officials is not unique to NASA, such pressure creates additional difficulties for the Agency as it seeks to manage its aging infrastructure.

Finally, demolishing or disposing of facilities that NASA no longer needs to fulfill its mission is not without cost. In many instances, NASA must conduct environmental remediation before it can dispose of a facility. For example, under the terms of its current agreement with California, NASA estimates that the environmental cleanup of its Santa Susana Field Laboratory will cost more than $200 million. Accordingly, the Agency's ability to reduce its real property footprint depends in large part on funding for cleanup and other costs associated with demolition and disposal. However, in this era of constrained Federal budgets, the amount of money dedicated to these activities is not likely to increase. In fact, although the Office of Management and Budget (OMB) supported NASA's facility strategy to reduce its infrastructure, for FYs 2013 through 2017 OMB only supported a budget request for approximately 50 percent of the resources required for the Agency's renewal strategy.

NASA officials readily acknowledge that the Agency has more infrastructure than it needs to carry out current and planned missions and the Agency has several promising initiatives underway to manage its infrastructure, including organizational changes, a new facilities strategy, an analytical framework for making infrastructure decisions, and improvements in managing its real property data. While we view these initiatives as positive steps, most are in the early stages of development and NASA has attempted infrastructure reduction initiatives in the

past with limited success. Absent strong and sustained leadership to see its current efforts through and incorporate them into Agency policy, we are concerned that these latest efforts will meet a similar fate. Specifically, Agency leaders must ensure that these initiatives are institutionalized, coordinated, and communicated both inside and outside the Agency. In addition, they must be willing to make the difficult decisions to divest unneeded infrastructure; effectively communicate those decisions to stakeholders; and withstand the inevitable pressures from Federal, state, and local officials.

Leasing unneeded facilities offers NASA another means to help address maintenance costs associated with its aging and underutilized facilities. However, Federal law and policy prohibit NASA from leasing facilities for which it has no current or future mission-related use. Instead, the Agency should consider other options for these facilities such as demolition or reporting the property to the General Services Administration for sale or transfer to another entity. The challenge for NASA is to use leasing when appropriate to generate revenue to offset facilities operations and maintenance costs while not using it as a way to hold on to facilities it does not need. An August 2012 OIG audit examined NASA's leasing practices and offered eight recommendations for improving the effectiveness of its efforts.

Given the disparity between the Agency's infrastructure and its mission-related needs, as well as the likelihood of continued constrained budgets, it is imperative that NASA move forward aggressively with its infrastructure reduction efforts. To achieve this goal, the Agency will need to move away from its longstanding "keep it in case you need it" mindset and overcome historical incentives for the Centers to build up and maintain unneeded capabilities. In addition, NASA officials need to manage the concerns of political leaders about the impacts eliminating or consolidating facilities will have on Centers' missions, their workforces, and the local communities. Moreover, abrupt changes in the strategic direction of the Nation's space policy by Congress, the President, and NASA will continue to add an element of uncertainty regarding the missions the Agency will pursue and therefore the facilities it will need to achieve those missions.

We acknowledge that NASA's best efforts to address these challenges may ultimately be insufficient to overcome the cultural and political obstacles that have impeded past efforts to eliminate Agency facilities. Accordingly, an outside process similar to the Department of Defense's Base Realignment and Closure Commission may be necessary to make the difficult but necessary infrastructure decisions.

7. Overhauling NASA's Information Technology Governance Structure

Information technology (IT) plays an integral role in every facet of NASA's operations. The Agency spends more than $1.4 billion annually on a portfolio of IT assets that includes approximately 500 information systems used to control spacecraft, collect and process scientific data, and enable NASA personnel to collaborate with colleagues around the world. Hundreds of thousands of individuals, including NASA personnel, contractors, members of academia, and the public, rely on these IT systems daily.

For more than 2 decades, NASA has struggled to implement an effective IT governance approach that appropriately aligns authority and responsibility commensurate with the Agency's

overall mission. Since at least 1990, the OIG and the GAO have highlighted a series of challenges stemming from the limited authority of NASA's Chief Information Officer (CIO), decentralization of Agency IT operations, ineffective IT governance, and shortcomings in the Agency's IT security.

IT governance is a process for designing, procuring, and protecting IT resources. Because IT is intrinsic and pervasive throughout NASA, the Agency's IT governance structure directly affects its ability to attain its strategic goals. For this reason, effective IT governance must balance compliance, cost, risk, security, and mission success to meet the needs of internal and external stakeholders.

NASA's IT assets generally fall into two broad categories: institutional and Mission. The institutional systems support the day-to-day work of NASA employees and include networks, data centers, web services, desktop and laptop computers, mobile platforms, enterprise business applications, and other end-user tools such as e-mail and calendaring. The Mission systems support the Agency's aeronautics, science, and space exploration programs and host IT systems that control spacecraft, collect and process scientific data, and perform other critical Agency functions.

The Mission Directorates fund the IT assets on NASA's Mission networks, and funding for the IT investments associated with many NASA programs and projects is embedded in the funding for the underlying mission. In FY 2012, NASA spent 38 percent of its IT budget on institutional assets directly controlled by the Office of the Chief Information Officer (OCIO) or NASA Centers and the remaining 62 percent on assets controlled by the Mission Directorates.

Under NASA's current governance structure, the Agency CIO has little visibility into the Agency's Mission IT assets. Each Mission Directorate employs a CIO and IT security personnel who report through the Directorate's management chain rather than to the Agency CIO. The Mission Directorate CIO and IT personnel are responsible for security, risk determination, and risk acceptance for the Mission networks and associated IT assets. This organizational structure provides the Agency CIO with limited insight and control over the security of NASA's Mission IT assets.

Each NASA Center also employs a CIO and IT staff. For many years, Center CIOs reported to their respective Center Directors. In 2010, NASA revised this management structure so that the Center CIOs now report to the Agency CIO. The Agency CIO has delegated to the Center CIOs the responsibility, authority, and accountability for the Centers' IT portfolios. Center CIOs are responsible for ensuring that Center IT activities align with Federal and Agency requirements and for supporting the Agency CIO's review of Center IT investments. The Center CIOs receive their funding through each Center's budget, not through the OCIO. In addition to the CIOs, various boards and councils play a role in NASA's IT governance structure.

In a June 2013 audit, we examined whether NASA's OCIO has the organizational, budgetary, and regulatory framework needed to effectively meet the Agency's varied missions.[15] We found that the decentralized nature of NASA's operations and its longstanding culture of autonomy

[15] NASA OIG, "NASA's Information Technology Governance" (IG-13-015, June 5, 2013).

hinder its ability to implement effective IT governance. The Agency CIO has limited visibility and control over a majority of the Agency's IT investments, operates in an organizational structure that marginalizes the authority of the position, and cannot enforce security measures across NASA's computer networks. Moreover, the current IT governance structure is overly complex and does not function effectively. As a result, Agency managers tend to rely on informal relationships rather than formalized business processes when making IT-related decisions. While other Federal agencies are moving toward a centralized IT structure under which a senior manager has ultimate decision authority over IT budgets and resources, NASA continues to operate under a decentralized model that relegates decision making about critical IT issues to numerous individuals across the Agency, leaving such decisions outside the purview of the NASA CIO. As a result, NASA's current IT governance model weakens accountability and does not ensure that IT assets across the Agency are cost effective and secure.

With mission critical assets at stake and in an era of shrinking budgets, NASA must take a holistic approach to managing its portfolio of IT systems. To overcome the barriers that have resulted in the inefficient and ineffective management of the Agency's IT assets, we made a series of recommendations to NASA to overhaul its IT governance structure to centralize IT functions and establish the Agency CIO as the top management official responsible for its entire IT portfolio, including empowering the Agency CIO to approve all IT procurements over a monetary threshold that captures the majority of IT expenditures and making the Agency CIO a direct report to the NASA Administrator. We also recommended that the Administrator reevaluate the relevancy, composition, and purpose of NASA's primary IT governance boards in light of the changes made to the governance structure and require the use of reconstituted governance boards for all major IT decisions and investments. Finally, we suggested that the NASA Administrator reevaluate the resources of the OCIO to ensure that the Office has the appropriate number of personnel with the appropriate capabilities and skill sets.

To accomplish the fundamental changes recommended in our June 2013 report, strong leadership by the CIO and OCIO staff will be required. However, the CIO cannot make these changes alone. Rather, the NASA Administrator must be the driving force behind such sweeping organizational change.

8. Ensuring Security of Agency Information Technology Systems

NASA's high profile and the relatively large number of Agency networks coupled with its statutory mission to share scientific information present unique IT security challenges. The Agency's vast connectivity with outside organizations – most notably nongovernmental entities such as educational institutions and research facilities – offers cybercriminals a larger target than that of most other Government agencies.

In FYs 2012 and 2013, NASA reported 5,143 computer security incidents resulting in the installation of malicious software on or unauthorized access to its computers. These incidents spanned a continuum from individuals testing their skills to break into systems, to well-organized criminal enterprises hacking for profit, to intrusions that may have been sponsored by foreign intelligence services seeking to further their countries' objectives. These intrusions have affected thousands of NASA computers, caused disruption to mission operations, and resulted in the theft of export-controlled and otherwise sensitive data.

To protect the Agency against inevitable cyberattacks, NASA must ensure that its IT systems and associated components are regularly safeguarded, assessed, and monitored. For this critical effort, in FY 2014 OCIO dedicated an additional $10 million to fund a series of initiatives to address IT security concerns we reported. Planned projects for this initiative include:

- modernizing and expanding continuous monitoring and network penetration testing;
- deploying intrusion detection systems across mission, corporate, and research networks;
- increasing web application security scanning; and
- implementing intrusion prevention systems.

Over the past 5 years, the OIG has issued 20 audit reports containing 63 recommendations designed to improve NASA's IT security. For example, in a December 2011 report we identified several issues relating to NASA's transition from its previous "snapshot" approach for certifying the security of its IT systems to a continuous monitoring program in which maintains ongoing awareness of information security, vulnerabilities, and threats to support organizational risk management decisions.[16] We found that although NASA has made progress in transitioning to continuous monitoring, the Agency still needed to: (1) create and maintain a complete, up-to-date record of IT components connected to Agency networks; (2) define the security configuration baselines that are required for its system components and develop an effective means of assessing compliance with those baselines; and (3) use best practices for vulnerability management on all its IT systems. As of September 2013, these recommendations remained open.

In a July 2013 report, we examined the efficacy of NASA's efforts to adopt cloud-computing technologies.[17] We found that weaknesses in NASA's IT governance and risk management practices had impeded the Agency from fully realizing the benefits of cloud computing and potentially put NASA systems and data stored in the cloud at risk. For example, several NASA Centers moved Agency systems and data into public clouds without the knowledge or consent of the OCIO and on five occasions NASA acquired cloud-computing services using contracts that failed to fully address the business and IT security risks unique to the cloud environment.

We also examined the Agency's policies and procedures related to the acquisition of IT security assessment and monitoring tools in a March 2013 report and found that NASA's IT investment management process does not fully capture, assess, and consolidate IT security tool requirements across the Agency and therefore misses opportunities to capitalize on efficiencies and leverage purchasing power on critical IT security investments.[18] With improved awareness of its IT portfolio and visibility over its purchases, NASA could reduce its costs for IT security assessment and monitoring tools and potentially save millions of dollars annually in maintenance costs. We recommended that the CIO modify existing processes to capture detailed IT security

[16] NASA OIG, "NASA Faces Significant Challenges in Transitioning to a Continuous Monitoring Approach for Its Information Technology Systems" (IG-12-006, December 5, 2011).

[17] NASA OIG, "NASA's Progress in Adopting Cloud-Computing Technologies" (IG-13-021, July 29, 2013).

[18] NASA OIG, "NASA's Process for Acquiring Information Technology Security Assessment and Monitoring Tools" (IG-13-006, March 18, 2013).

requirements and enable greater visibility over existing inventory and planned acquisition of IT assessment and monitoring tools.

Currently, we are reviewing the security of NASA's publicly accessible websites and the Agency's efforts to reduce the number of these sites. NASA manages approximately 1,600 publicly accessible web applications and more than 130,000 unique Internet protocol addresses, representing roughly half of all publicly-accessible civilian Federal Government websites. The sheer scope of the Agency's web presence represents a significant security risk because each public-facing website provides a point of entry for unauthorized access to potentially sensitive information. For example, in September 2013 a number of NASA websites hosted by the Ames Research Center had to be taken offline after an international hacker posted political statements opposing U.S. policy.

In addition to our audit work, OIG investigators have conducted more than 120 investigations of breaches of NASA IT networks over the past 5 years, several of which have resulted in the arrests or convictions of foreign nationals in China, Great Britain, Italy, Nigeria, Portugal, Romania, Turkey, Venezuela, Australia, and Estonia. For example, in January 2013 a Romanian national who allegedly ran a "bulletproof hosting" service that enabled cyber criminals to distribute malicious software (malware) and conduct other sophisticated cybercrimes was indicted in New York on multiple conspiracy counts. Malware distributed by this hosting service infected more than one million computers worldwide, causing tens of millions of dollars in losses to the affected individuals, businesses, and government entities, including NASA. In another case, a Nigerian man was arraigned in a Nigerian court on charges he illegally accessed NASA and other U.S. Government e-mail accounts and used them to defraud victims worldwide.

NASA increasingly has become a target of a sophisticated form of attack known as advanced persistent threats (APT). APTs refer to those groups that are particularly well resourced and committed to steal or modify information from computer systems and networks without detection. The individuals or nations behind these attacks are typically well organized and funded and often target high-profile organizations like NASA. Moreover, even after NASA fixes the vulnerability that permitted the attack to succeed, the attacker may covertly maintain a foothold inside NASA's system for future exploits.

In FY 2011, NASA reported it was the victim of 47 APT attacks, 13 of which successfully compromised Agency computers. In FY 2012, NASA reported 55 APT attacks, 7 of which successfully compromised Agency computers. The OIG continues to work with its counterparts in both the law enforcement and the intelligence communities to help protect NASA's IT systems.

9. Ensuring Integrity of the Contracting and Grant Process

Approximately 80 percent of NASA's $17.7 billion FY 2012 budget was spent on contracts to procure goods and services and provide funding to grant and award recipients. Given the large amount of taxpayer funds NASA spends on contract awards, managers are constantly challenged to ensure that the Agency pays contractors in accordance with contract terms and receives fair value for its money. During the past year, the OIG continued to uncover fraud and other problems related to NASA contracts. For example:

- Six executives of two Virginia security firms were sentenced for fraudulently obtaining more than $31 million in Government contract payments set aside for disadvantaged small businesses. After becoming ineligible to participate in the disadvantaged small business program, the executives conspired to create a shell company to illegally obtain small business contracts from NASA and other Government agencies. The shell company secured more than $31 million in Government payments, which generated more than $6 million in salary and other payments to the executives. The executives were sentenced to prison for up to 6 years, received fines totaling more than $1 million, and were ordered to make $7.8 million in restitution.
- The Department of Justice entered into a $3.6 million civil settlement with Crown Roofing Services, Inc., USS Engineering LLC, and company owners resolving claims that the companies violated the False Claims and Anti-Kickback statutes in connection with a NASA contract. An investigation by the NASA OIG found that the companies made illegal payments to two Johnson Space Center contracting officials. Both officials and the contractor previously pleaded guilty to related criminal charges.
- Gulf Cities Testing Laboratories, a Stennis Space Center contractor, was convicted for making false statements to NASA concerning testing of concrete used on a flight engine test stand. The company claimed to have completed the testing in compliance with industry standards when in fact it used faulty methods, uncalibrated or broken test equipment, or had not performed the testing at all.

One area that continues to be a challenge to protect from fraud is NASA's Small Business Innovation Research (SBIR) program. NASA awarded approximately $154 million to small businesses under this program during FY 2013 to stimulate technological innovation, increase participation by small businesses in federally funded research and development, and increase private sector commercialization of innovations derived from federally funded research and development efforts. In multiple investigations and audits over the years, the OIG has identified significant fraud, waste, and abuse in NASA's SBIR Program.

For example, this past year two executives of a scientific research company were indicted for wire fraud, conspiracy to commit wire fraud, and money laundering in California for defrauding NASA and the National Science Foundation by creating the false impression they had not applied for overlapping SBIR contracts with both agencies. In another case the OIG investigated jointly with other Federal agencies, the U.S. Air Force suspended 11 contractors and their company officers from directly or indirectly receiving SBIR contracts after finding that the contractors claimed research and development costs for components that had already been developed and sold commercially.

The OIG's audit work during the past year also identified weaknesses in NASA contract management. For example, a November 2013 audit examined whether NASA was effectively using award fees to motivate contractor performance and improve acquisition outcomes (an award fee is a pool of money a contractor may earn in whole or in part by meeting or exceeding pre-determined performance criteria).[19] We found that although NASA had implemented processes intended to improve contractor performance and acquisition outcomes, a number of

[19] NASA OIG, "NASA's Use of Award-fee Contracts" (IG-14-003, November 19, 2013).

questionable practices, including overly complex award formulas and a contract clause designed to hold contractors accountable for the quality of the final product that disregards interim performance evaluations, have diminished the effectiveness of award-fee contracts at the Agency. In addition, NASA failed to collect required data on award fee contracts, thereby reducing its ability to measure their effectiveness. Our report offered 12 recommendations aimed at improving NASA's efforts in this area, and while the Agency disagreed with 7, we are working to identify actions to bring those to resolution.

This past year we also examined whether NASA effectively monitored energy contracts to ensure that payments do not exceed the savings guaranteed in the contracts. An April 2013 audit found that the Johnson Space Center mismanaged a $42.7 million energy contract by not requiring the contractor to submit annual savings verification reports and accepting a flawed report for the first year, failing to consider the effect of renovations to or demolition of facilities on the guaranteed savings rate, and adding work to the contract without ensuring that energy savings would cover the additional costs.[20]

Apart from contracts, NASA awards approximately $500 million in grants annually to facilitate research and development projects; to fund scholarships, fellowships, or stipends to students and teachers; and to fund educational research performed by educational institutions or other nonprofit organizations. NASA faces the ongoing challenge of ensuring that these funds are administered appropriately and that recipients are accomplishing stated goals.

Over the past 5 years, the OIG conducted 30 grant fraud investigations resulting in 4 prosecutions and $13.2 million in restitution and recoveries and an additional $15 million in civil settlements. For example, a recent joint investigation with the Nuclear Regulatory Commission OIG culminated in the University of Florida agreeing to pay $422,000 to settle mischarging allegations. The investigation revealed that a former university professor had directed staff not conducting grant-related work to charge their time to the grants. In another case, a former principal investigator from Morehouse College was debarred from doing business with the Federal Government for a period of 5 years after a joint investigation by the NASA and National Science Foundation OIGs revealed that he had misused grant funds for personal travel and for equipment and services unrelated to the grants. Morehouse College agreed to pay $1.2 million to the Government in a civil settlement.

For both contracts and grants, NASA's award closeout process is the final step in ensuring taxpayer funds are accounted for properly. The process confirms that contractors and grantees have met the financial and reporting requirements of an award and allows NASA to redirect unused funds to other projects and priorities. We are currently examining whether NASA has procedures in place to ensure that award instruments are closed in a timely manner and in accordance with established requirements and that any unused funds are identified and de-obligated.

[20] NASA OIG, "NASA's Management of Energy Savings Contracts" (IG-13-014, April 8, 2013).

National Aeronautics and Space Administration
Office of the Administrator
Washington, DC 20546-0001

November 19, 2013

TO: Inspector General

FROM: Administrator

SUBJECT: Response to NASA's Top Management and Performance Challenges

The National Aeronautics and Space Administration (NASA) appreciates the opportunity to review and comment on "NASA's Top Management and Performance Challenges."

NASA also appreciates and recognizes the continuing efforts of the Office of the Inspector General (OIG) in identifying significant management and performance challenges facing the Agency, as well as the OIG's recognition of progress NASA has made in addressing prior and current management and performance challenges.

The OIG identifies one overarching and nine specific management and performance challenges facing the Agency. NASA acknowledges the challenges articulated by the OIG and is working proactively to effectively mitigate them as outlined in our attached response.

Charles F. Bolden, Jr.

Enclosure

MANAGEMENT'S RESPONSE
TO THE OFFICE OF THE INSPECTOR GENERAL'S MEMORANDUM ON THE TOP MANAGEMENT AND PERFORMANCE CHALLENGES OF NASA
November 2013

Overarching Challenge

The OIG identifies an overarching challenge shared by all Federal agencies in terms of the uncertainty of funding in an environment of increasing fiscal uncertainty. NASA is operating in an uncertain budget environment. It has submitted a program that aligns to the President's request of $17.7 billion in FY 2014. It is also facing very different Congressional committee marks in FY 2014 of $16.6 billion and $18 billion between the House and Senate respectively. NASA will be watching developments in Congress as it considers the path forward into FY 2014. Initial calculations project that FY 2014 sequestered levels are likely to be $16.9 billion or lower, compared with $17.7 billion requested in FY 2014. Like all Government agencies pursuant to OMB direction, NASA is also pursuing alternative paths for FY 2015 planning at reduced levels that assume an ongoing sequestration scenario.

Specific Management and Performance Challenges

1. **Considering Whether to Further Extend the Life of the International Space Station**

Extending the life of the International Space Station (ISS) beyond 2020 will advance the Nation's goals in space and benefit humanity on Earth. Extending the ISS beyond 2020 will enable the development of a stable commercial space industry in transportation of crew and cargo to low Earth orbit (LEO) as well as commercial applications from space research. Additionally, extending the life of the ISS will enable significantly more research opportunities that will benefit humanity through, for example, medical research into Alzheimer's and osteoporosis and research in fundamental physics and biology. Extended ISS operations will also expand our knowledge of the Earth, the solar system, and the universe through the operation of existing and new Earth and space science instruments. Most importantly, operation of the ISS beyond 2020 is critical to the future human exploration of deep space. Ongoing exploration-driven human health and performance research and technology development and demonstration activities to enable long-duration human missions beyond LEO will not be complete by 2020, based on current assessments. Extending the ISS is also a critical element of maintaining the United States' leadership in human spaceflight around the world during a time when other nations are looking for opportunities to develop their own capabilities.

The ISS Program, including the International Partners, have already certified the life of the on-orbit platform, including modules, primary structure, power generation, and other systems, to 2020. The Partner life assessment to 2028 is expected to be completed by mid-2014. From the United States' segment perspective, based on current failure rates and structural fatigue models, the primary components such as the Nodes, Laboratory, truss structures, and critical systems such as solar arrays are within their life certification at least until 2028. As other components such as utilization support equipment, data management, and avionics components reach their end of life, they can be replaced as the technology advances.

NASA is currently analyzing the budget and operational needs to sustain and utilize the ISS to the greatest extent possible beyond 2020. NASA is working with the International Partners to develop a strategy to continue the Partnership beyond 2020 and to build on our success in ISS operations to collaborate on deep space human exploration missions.

2. Developing the Space Launch System and its Component Programs

The Exploration Systems Development (ESD) Enterprise is aggressively preparing the Space Launch System (SLS), Orion Multi-Purpose Crew Vehicle (Orion), and the Exploration Ground Systems (EGS) needed to provide the foundational elements required for Deep Space Exploration. Although the Authorization Act of 2010 mandated NASA to achieve operational capability by 2016, the funding required to accomplish this did not materialize, and NASA is now targeting 2017 for the first launch of the combined SLS and Orion vehicles. ESD has established a proactive affordability initiative that each program has implemented to find innovative and effective ways to avoid the need for greater expenditures in the development phases of each of the programs. This effort has resulted in tens of millions of dollars in cost avoidance both now and in the future. Use of existing hardware, such as the RS-25 engines (formerly the Space Shuttle Main Engines), is one example of an affordability approach that avoids the need for increased development costs. NASA is adapting existing flight and ground hardware, facilities, and designs in the ESD Enterprise in an effort to reduce the overall cost of design reviews, testing, and certification. Funding instability and uncertainty remains NASA's number one challenge to the success of developing the first human deep-space exploration architecture, resulting in limited options to accelerate or modify the current development approach. SLS is developing increasing lift capabilities, evolving to the 130 metric ton capability. NASA is committed to the development of the full 130 metric ton SLS capability and is doing so with an evolutionary approach. The evolutionary approach for SLS development spreads the cost of achieving the ultimate 130 metric ton capability in an affordable manner overtime while making significant gains in mission capability along the way. This flexibility permits the necessary mixed manifesting for multi-launch missions such as those to Mars while preserving the cost-saving option of not employing the upper stage when the greater capability is not needed for any specific launch. As the plan for vehicle evolution continues to be matured, this operational plan for affordably preserving multiple capability levels will be refined. It is difficult to envision funding levels that exist today in perpetuity; however, if constrained to these levels, it will indeed extend the achievement of critical deep space missions well into the next decade.

3. Securing Commercial Crew Transportation Services

The OIG cites four challenges to NASA's Commercial Crew Development program (CCP) which were described in the OIG's November 2013 audit report[1]. Specifically, these challenges consist of: (1) stability of funding; (2) cost estimation; (3) certification guidance; and (4) coordination with other Federal agencies. NASA has provided specific responses to each recommendation articulated in the report in which NASA concurred with the OIG's recommendations, as well as detailed corrective actions that the Agency plans to address in response to the recommendations.

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[1] "*NASA's Management of the Commercial Crew Program*" (IG-14-001)

Unstable funding: NASA continues to request sufficient funds in the Agency's budget request to Congress to ensure that the Program can meet its objectives. For example, NASA's budget request for FY 2014 for the CCP is $821.4 million, which the Agency believes is sufficient in FY 2014 to ensure the availability of crew transportation services by FY 2017, assuming sufficient future budgets and technical progress. In addition, NASA will continue to strive for transparent and comprehensive justifications for the budget requests.

Cost estimates: NASA has developed the Agency's program costs for CCP on a year-by-year basis throughout its life. These have informed the Agency's annual President's Budget Request. NASA will continue to employ a series of reviews, involving both internal and external checks to continually examine the Commercial Crew Program's status. These reviews, such as equivalent Key Decision Points, quarterly progress reviews, risk reviews, and independent reviews, can identify cost risks or other indicators which may suggest that more comprehensive cost estimates are warranted.

Certification guidance: It should be noted that NASA's Certification Products Contracts initially involved over 400 deliverables spanning three different partners with varying designs and processes and formats resulting in thousands of NASA comments in response. CCP was successful in dispositioning all deliverables by the end of September 2013 which fully met the need for timely response as part of the overall CCP acquisition strategy. In addition, the Program conducted a workshop in September to evaluate the lessons learned from the initial round of deliverables and developed process improvements to ensure more timely disposition of deliverables in the future.

Coordination with other Federal agencies: NASA and the Federal Aviation Administration (FAA) have ongoing and comprehensive interactions regarding crew/public safety requirements and regulations. In addition, NASA concurs with the OIG's recommendation to expand this collaboration to include the United States Air Force. A number of specific actions have been undertaken, and others are in work by NASA to expand its collaborations with both the FAA and the Air Force.

4. Ensuring Continued Efficacy of the Space Communications Network

NASA's Space Communications and Navigation (SCaN) Program is responsible for providing communications, navigation, and delivery of scientific data to space flight missions. SCaN is comprised of three networks: (1) the Near Earth Network, which covers LEO and portions of geosynchronous orbit; (2) the Space Network, which controls the Tracking and Data Relay Satellites (TDRS) through a network of geographically diverse ground systems; and (3) the Deep Space Network, which covers NASA mission needs beyond geosynchronous orbit[2]. Without SCaN services, NASA could not receive data transmission from its satellites and robotic missions or control such missions from Earth, and space hardware worth tens of billions of dollars would become orbital debris. While NASA has provided these services for over 30 years, many of its current satellite communications systems are aging and increasingly difficult to repair.

[2] A geosynchronous orbit is one in which a satellite is always in the same position with respect to the rotating Earth.

In 2006, NASA initiated the SCaN Program to create an integrated Agency-wide space communications and navigation architecture. The evolution of the integrated system will take place in phases. With a planned FY 2014 budget of $554 million, the Near Earth, Space, and Deep Space networks initially will remain independent. In the interim, SCaN is adding new capabilities that extend the functionality of the networks and will be incorporated into the integrated architecture. SCaN also manages the Spectrum Management Program for the Agency and is deeply involved with other space-faring nations in this area. The Spectrum Management Program ensures that all NASA activities comply with national and international laws applicable to the use of the electromagnetic spectrum. The Program continues to address competing interests for use of the electromagnetic spectrum, to include emerging commercial broadband services.

NASA has plans to upgrade its Space Network through an $862 million Space Network Ground Segment Sustainment (SGSS) Project. The purpose of the SGSS Project is to implement a modern ground station that will enable delivery of high quality services to the Space Network community while significantly reducing operations and maintenance costs. Without the upgrades, the ground system will become increasingly unreliable and more expensive to maintain. To complement the ground station, NASA maintains the TDRS fleet of satellites that transmit the tracking, data, voice, and video services from the ground station to the ISS, NASA's space and Earth science missions, other Federal agencies, and commercial users. The Space Network is in the process of upgrading and replenishing failing TDRS, many of which are operating well beyond their planned lives. The TDRS replenishment efforts are major components of maintaining Space Network capabilities.

NASA is also upgrading the Deep Space Network. The Deep Space Network was established in 1963 to provide communications for all of NASA's robotic missions outside Earth orbit, international spacecraft as well as scientific investigations through radio astronomy, radio science, and radar activities. The Deep Space Network is run from three ground-based sites (Goldstone, California; Madrid, Spain; and Canberra, Australia) with one 70-meter antenna and multiple 34-meter antennas at each location for 24/7 coverage. As part of the upgrade, NASA will replace the aged 70-meter antennas at all three Deep Space Network sites with arrays of new 34-meter antennas by 2025 at an estimated cost of $369 million. The upgrades will support a greater number of missions and spacecraft as well as the increased complexity and data transfer requirements of those missions. For example, NASA projects that future deep space missions will require much faster data transmission than the current system can provide. In addition, NASA expects that future robotic missions will require more precise spacecraft navigation for entry, descent, landing, and outer planet explorations as well as to support manned missions to Mars.

Both the SGSS and DSN sustainment and upgrade activities are primarily funded out of their maintenance and sustainment budgets. The majority of the funds for these activities come from deferring maintenance and the lower operating costs associated with the new systems.

The OIG is examining the SCaN Program through a series of audits, the first of which will focus on the Space Network to assess how NASA is identifying and adjusting capabilities to meet mission requirements; managing program, cost, schedule, and performance; and addressing key risks facing the Project. Future audits will examine the Deep Space Network, Near Earth Network, and Spectrum Management and conclude with a capping report on the entire SCaN Program.

5. Maintaining Cost and Schedule for the James Webb Space Telescope

Since the September 2011 rebaseline, the James Webb Space Telescope (JWST) program has stayed within its approved budget (both profile and total life cycle) and has maintained its October 2018 launch readiness date. At the time of the rebaseline, a funded schedule reserve of 13 months was built into the plan; as of October 2013 there are 14 months of funded schedule reserve. Several strategies are employed to maintain cost and schedule performance of JWST.

First, NASA established a dedicated Program Office at Headquarters, headed by a Program Director that reports to the NASA Associate Administrator. The Program Office, including the Program Manager within the Office, works directly with Project Office officials to maintain deep and current insight into progress and issues and also directly briefs executive branch and legislative branch officials on progress and issues.

Second, this new Program Office conducts greatly increased communication efforts, including daily and weekly working discussions between Program and Project officials, weekly discussions with senior NASA Headquarters officials, participation by Program officials in monthly project technical and programmatic reviews, and quarterly progress reviews with senior NASA officials and senior industry officials. These increased interactions ensure that key individuals are kept current on the latest project progress and issues. The Program Office greatly expanded the scope and duration of the monthly Flight Program Review, increasing the duration from 20 minutes to 2.5 hours, to ensure the review is both comprehensive and allows time for questions by the participants. The Program Office invites key members of the JWST Standing Review Board (SRB) and the Government Accountability Office (GAO) to attend the Flight Program Review (FPR) on a quarterly basis to ensure the SRB and GAO remain up to date on progress and issues. This is a brief summary listing of the expanded working discussions and reviews that were initiated as part of the formation of the Program Office and rebaseline.

Third, NASA expanded its cost and schedule analyses that are performed and subsequently reported by the Program and Project Offices, all to provide additional information for decision-making by Program and Project management. In particular, the Project conducts independent analysis of earned value data from the performing contractors, and the Program conducts reviews of that data and also overall Project financial posture. These analysis products are made available within NASA Headquarters and also to the GAO. In addition, Goddard Space Flight Center (GSFC) Flight Projects Directorate conducts additional analysis and reports the results of that analysis within GSFC and to the Program Office.

Fourth, the Program and Project prepare a substantial set of annual milestones prior to each fiscal year, milestones involving the most difficult and important work by all JWST-supporting organizations for the upcoming fiscal year, and those milestones are tracked and reported internally to NASA and to all external stakeholders in the government and scientific community. This measure was taken to ensure that the supporting organizations recognize the importance of performance-to-plan. To date the results have been impressive, especially considering the enormous technical accomplishment each milestone represents.

6. Managing NASA's Infrastructure and Facilities

NASA recognizes that managing its technically unique infrastructure is a top management challenge; NASA is implementing its strategy to reduce and modernize its infrastructure within available and anticipated budget levels.

Demolition/ Disposal: NASA's demolition program has been active since 2004 and has provided consistent, dedicated funding to demolishing unneeded facilities. From 2010 through 2012, NASA demolished 191 facilities (just under 4% of inventory). Some of the major facilities demolished were: Nuclear Reactor at Plum Brook Station (PBS) in 2012; Vertical Processing Facility at Kennedy Space Center (KSC) in 2010; 16 Foot Transonic Wind Tunnel at Langley Research Center (LaRC) in 2011; B1 & B3 Propulsion Test Stands at PBS in 2011; 30x60 Foot Wind Tunnel at LaRC in 2012; and Building 2 Research Lab at GSFC in 2012. NASA's demolition program currently has demolition projects scheduled through 2017. The near-term focus of the demolition program is to demolish those facilities that supported the Shuttle Program but are no longer needed by the Agency. In addition, NASA has scheduled the demolition of several technical facilities that NASA no longer needs or will be retiring in the near future. As part of its budget formulation process, NASA assesses its infrastructure annually to identify facilities that should be included in the demolition program. Annual assessments typically identify 20 – 50 new projects that are scheduled into the demolition program.

In addition, NASA has taken steps to dispose of sites that are no longer needed by the Agency. In 2011, NASA closed the Palmdale, California, Orbiter Processing site and the White Sands Space Harbor. These sites were returned to the U.S. Air Force and U.S. Army, respectively. In 2012, working with the General Services Administration (GSA), NASA sold a site adjacent to the Cleveland Airport to a private developer. Additionally, NASA is preparing the Santa Susana Field Lab for eventual disposal.

Consolidation and Modernization: NASA is implementing a strategy of refurbishing, consolidating, and replacing key facilities within the expected budget limits. Projects such as the refurbishment of the Flight Hardware Development Facility and Structures; Dynamics & Thermal Vacuum Lab in 2014 at Marshall Space Flight Center (MSFC); and the new Launch Control Center in 2013 at Wallops Flight Facility (WFF) will serve to modernize key technical facilities. NASA is repairing and modernizing critical infrastructure through projects such as upgrade the KSC Industrial Area Chiller Plant (2014); replace support systems in Space Power Facility at Plum Brook Station in 2013; repair chilled water system, emergency power plant at Johnson Space Center (JSC) in 2013; revitalize high pressure industrial water system at Stennis Space Center (SSC) in 2013; replace the potable water system at SSC in 2012; and renovate the

East Test Area industrial water distribution system at MSFC in 2012. The 2013 project to replace the steam vacuum system boiler at the Atmospheric Reentry Materials and Structures Evaluation Facility (ARMSEF) at Ames Research Center (ARC) is the first major investment in a strategic plan to create a single consolidated ARMSEF that will meet NASA's research needs for the foreseeable future. The 2014 consolidated data center project at LaRC will consolidate 37 data centers across the Center into one efficient and modern Science Data Center. Similarly, the first phase of KSC's consolidated office facility includes a data center that will consolidate four separate data centers on site into one. Replacement facilities such as the Replacement Engineering Office Building 4220 at MSFC in 2011 and the Flight Project Center at GSFC in 2012 will replace obsolete facilities with modern efficient facilities and facilitate consolidating functions, shrinking NASA's footprint and improving mission operations.

The implementation of NASA's facility strategy is having a positive effect on NASA's infrastructure. NASA's 2012 facility assessment noted that NASA's deferred maintenance, which is an estimate of the essential but unfunded maintenance work necessary to bring all facilities up to a normal operating standard, decreased 5.7 percent from 2011 levels. The 2013 facility assessment estimated a further reduction of deferred maintenance of 1.5 percent. Both surveys noted that demolition and replacing major facilities are dominant factors in this reduction in deferred maintenance. An assessment of NASA's real property inventory indicates that the inventory has reduced slightly. NASA estimates that it will reduce administrative space by 398,000 square feet from a 2012 baseline by 2015.

Property Partnerships: NASA is partnering with the private sector and with other Federal agencies to make underutilized NASA facilities available to others when the facilities can support U.S. aerospace initiatives. KSC has entered several real property agreements with commercial entities for the operations and maintenance of NASA's underutilized facilities, including the Orbital Processing Facility, Space Shuttle Main Engine Processing Facility, Processing Control Center, Hangar N, Parachute Refurbishment Facility, and the Hypergolic Maintenance Facility. In order to further reduce KSC operating costs, KSC is seeking to enter into other agreements that will transfer operation and maintenance cost to commercial entities. Facilities that are being considered for leasing to commercial partners include Launch Pad 39A, the Shuttle Landing Facility, and the Vehicle Assembly Building. NASA, working with the GSA, has issued a request for proposal to obtain lease proposals from commercial entities for the rehabilitation and adaptive reuse of Hangar One and for the operation, management, and maintenance of Moffett Federal Airfield. Other NASA Centers, such as SSC, have been able to offer the Center's unique testing assets to the aerospace industry and research organizations.

Federal Transfers: NASA is working with GSA to identify underutilized spaces at NASA centers that could be used for consolidation with other Federal agencies. NASA has worked with GSA to transfer various underutilized assets at NASA assets to other Federal agencies. Finally, NASA is currently working to transfer land back to the Secretary of the Army that is currently used as an airfield at Goldstone Deep Space Communications Complex at Ft. Irwin, California. These agreements are expected to defray some of the costs of NASA's infrastructure, reduce the risk associated with the infrastructure, and support the national aerospace agenda.

Maintenance: Adequately maintaining facilities in the current budget environment is a challenge. Rising utility, labor and material costs put increasing pressure on decreasing facilities budgets. To manage maintenance within budget constraints, NASA relies on reliability center maintenance (RCM) of critical systems. RCM utilizes predictive testing techniques to identify conditions that could lead to failure or accelerated deterioration. In an effort to improve savings, some Centers are making small investments in remote monitoring of some equipment to reduce the number of field inspections required. NASA has utilized its enhanced use lease (EUL) authority to fund some maintenance and repair. In 2013, ARC used $2 million in EUL proceeds for facility maintenance and roof repairs. As other Centers enter into enhanced use leases as part of their property partnerships, enhanced use lease proceeds will increase, making additional funds available for facility maintenance.

7. Overhauling NASA's Information Technology Governance Structure

Improving Information Technology (IT) governance structure in response to the eight recommendations in the OIG's June 2013 report[3] is an Office of the Chief Information Officer (OCIO) fiscal year 2014 priority. The NASA Chief Information Officer (CIO) is now a direct report to the Administrator. In the first quarter of FY 2014, the OCIO will present a Phase 2 IT Governance model decision package to the Mission Support Council (MSC) and will conduct an Agency-wide Six Sigma Kaizen event to improve IT procurement approval processes with corresponding financial system changes, thereby ensuring alignment of IT procurements with Agency strategic direction. The OCIO assessed and identified improvements for IT governing boards; upon approval in early FY 2014, the OCIO will update board charters and communicate the streamlined board structure to Agency stakeholders. The OCIO will work with Mission Directorates to develop common roles and responsibilities and enhance coordination. In FY 2014, the OCIO will consider the results of the IT assessment and implement recommendations as appropriate to ensure organization and governance meet NASA's IT needs.

8. Ensuring Security of Agency Information Technology Systems

Significantly improving NASA's IT security posture in response to the dramatic increase in the number of cyber attacks in recent years is a NASA priority. Working within the IT security budget, the OCIO continues to complete major milestones toward its comprehensive, risk-based IT security program implementation based on continuous monitoring and use of automated tools. To meet the changing threat and risk environment, the OCIO will update NASA's information security policies, develop and test a real-time IT security dashboard reporting tool, transition from manually-generated to dynamically-generated System Security Plans, and develop a framework for an IT Security Tools Repository to leverage enterprise IT security tools and services. The OCIO will identify mandatory security controls mapped to the SANS Institute/Federal Bureau of Investigation Annual Top 20 Critical Controls. To enhance mitigation of Web-related vulnerabilities, NASA's OCIO will implement the Web Application Security Program (WASP). The OCIO will mature the NASA Security Operations Center (SOC) threat assessment and incident response capabilities, specifically introducing the Security Incident Management (SIM) system, an automated analysis capability that allows IT security

[3] "*NASA's Information Technology Governance*" (IG-13-015)

professionals to focus on true (rather than false positive) security issues to better protect NASA's information systems.

With anticipated increased funding for IT security efforts in FYs 2014-2016, the OCIO plans to deploy a unified continuous monitoring program, expand NASA's enterprise Intrusion Detection System (IDS), expand NASA's WASP and penetration testing programs, and implement IDS at NASA Trusted Internet Connections (TIC) locations.

9. Ensuring Integrity of the Contracting and Grant Process

NASA's Office of Procurement (OP) appreciates the investigative and audit work cited by the OIG and acknowledges the importance of this effort, particularly where fraud is uncovered and remedies are made. The OIG's effort in this area assists the Agency and OP in uncovering systemic areas of weakness where additional resources can be cost-effectively employed to increase oversight or policies can be revised to effectively minimize risk. The OIG's success in criminal prosecutions and civil settlements also serves as an important deterrent to future fraudulent activities.

OP believes there have been significant improvements made in the oversight and operation of the Small Business Innovation Research (SBIR) program to reduce the likelihood of fraud, waste, and abuse on the program. These improvements include a new process that has been implemented by the NSSC that highlights the Contacting Officer's Representative (COR) involvement in review and acceptance of deliverables and certification before payment is made. CORs are now responsible for reviewing both deliverables and invoices and must take affirmative action to enable payment processing before final payment in Phase 1, and for all Payments in Phase 2. For Final Phase 1 payments and all Phase 2 Payments, CORs must accept deliverables and invoices in the Electronic Handbook – then CORs must access a separate system, Accounts Payable Work Management System, to approve the invoice so that payments can be processed. CORs now sign an amended delegation form (as compared to the past form) clarifying their roles and responsibilities associated with deliverables and invoices. The NSSC offers invoice approval training for all SBIR/Small Business Technology Transfer (STTR) program CORs, and training on SBIR/STTR CORs roles and responsibilities will be further extended to Center Technology Infusion Managers (TIMs). Virtual site visits are conducted by the Contracting Officer, COR, and other technical representatives to ensure vendors are performing in accordance with the contract requirements. More than 70 virtual site visits were competed since 2010. The SBIR Program Office has implemented the recommendations articulated in the OIG's January 2011[4] and February 2012[5] reports. Consequently, we believe these actions significantly reduce the risk of fraud, waste, and abuse associated with NASA's SBIR Program.

The OP continues to improve upon the Agency's approach to Energy Savings Performance Contracts (ESPCs). NASA believes that the OIG's findings on ESPCs were specific to a

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[4] "*Review of NASA's Management of Its Small Business Innovation Research Program*" (IG-11-010-R)

[5] "*NASA's Management of Small Business Innovative Research and Small Business Technology Transfer Contracts Funded by the Recovery Act*" (IG-12-009-R)

pathfinder JSC contract awarded in accordance with the best known standards of that time when the ESPCs represented a new approach to performance contracts. This was also the first ESPC awarded by NASA. Over time, increased experience with these contracts has expanded our perspective of those early standards. Therefore, in response to the OIG's April 8, 2013 report[6], NASA has aggressively pursued a range of corrective actions to update requirements, training, and oversight of ESPCs across the Agency, including the following:

On May 13, 2013, the Assistant Administrator for Procurement and the Assistant Administrator for Strategic Infrastructure issued a joint memo entitled "*Updating NASA Procedural Requirements on Energy Saving Performance Contracts (ESPC)*" which emphasized better utilization and oversight of ESPCs.

- On July 12, 2013, NASA Procedural Requirement (NPR) 8570.1, NASA Energy Management Program, was revised to included specific policy on the proper use of ESPC and Utility Energy Services Contract (UESC) contracts; training for employees, developing requirements for awarding and administering these contracts; and proper oversight of awarded contracts.

- On August 20-22, 2013, NASA's Environmental Management Division coordinated ESPC/UESC training at the National Renewable Energy Lab (NREL) tailored to NASA ESPC/UESC projects for NASA personnel.

We believe the issue identified by the OIG represents a unique and isolated case. Given the (1) low likelihood of recurrence, (2) corrective actions taken, and most importantly, (3) the OIG's decision to close the related recommendation without requiring implementation, all confirm that this specific finding is not systemic.

Finally, we appreciate the OIG's acknowledgement that OP has implemented policies to improve the NASA award fee process based upon findings in previous GAO reports. However, OP does not agree with the OIG's analysis and conclusions relative to award fees.

Specifically, NASA's provisional payment formulas under award fee contracts are not overly complex. The proper application of the formula to a particular award fee situation can be confusing without the proper training, but the formula itself is not overly complex. The formula, as written, ensures that the proper amount of provisional award fee is paid during the life of an end-item award fee contract based upon any situation and award fee rating that may occur. OP also disagrees with the OIG's assertion that NASA's award fee process disregards interim performance evaluations. Under NASA's end-item award fee concept, in order to ensure that NASA receives a workable end product, the final award fee rating period supersedes all interim ratings. However, this does not diminish the importance of the interim evaluations. Interim evaluations are a valuable tool in assessing the contractor's progress toward providing the final end product.

We believe the OIG's assertion that NASA has failed to collect the required data on award fee contracts is incorrect. We believe NASA is complying fully with the requirements of FAR §16.401(f) through the implementation of the Office of Federal Procurement Policy's (OFPP) Incentive Contracting Working Group recommendations on the type of award fee data to collect. OP is collecting and analyzing award fee data in accordance with these recommendations.

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[6] "*NASA's Management of Energy Savings Contracts*" (IG-13-014)

Further, we believe that a March 6, 2013, GAO follow-up review to their March 1, 2011, report[7] supports our assertion that NASA has developed a satisfactory method to evaluate the effectiveness of award fees and gather data on award fee contracts.

[7] "*Opportunities to Reduce Potential Duplication in Government Programs, Save Tax Dollars, and Enhance Revenue*" (GAO-11-318SP)

FY 2013 Inspector General Act Amendments Report

Background

The Inspector General Act Amendments of 1988 (P.L. 100-504), require that each agency head submit semi-annual reports to Congress on the actions taken in response to Office of Inspector (OIG) audit, evaluation, and inspection reports. Consistent with the Reports Consolidation Act of 2000 (P.L. 106-531), the National Aeronautics and Space Administration (NASA) consolidates and annualizes the required semi-annual Inspector General Act Amendments reporting elements for inclusion the annual Agency Financial Report (AFR).

Required agency reporting under the 1988 amendments consists of:

1. Disclosure of OIG reports containing findings with monetary benefits (i.e., disallowed costs and funds put to better use):

    - for which management decisions were made during the reporting period (FY 2013);
    - for which final management decisions have been made, but final management action is pending;
    - for which final management action was taken during the reporting period, and;
    - for which no final management action was taken during the reporting period.

2. Disclosure of OIG recommendations pending final management action more than one year after the issuance of the associated audit report.

In addition to above statutory requirements, the Office of Management and Budget (OMB) has issued specific action requirements to federal agencies in their Circular No. A-50, "Audit Follow-up." These requirements include among other things that federal agencies ensure that final management decisions on audit recommendations are reached within six months after an OIG audit report is issued and that related corrective actions associated with the final management decision begin as soon as possible.

The following definitions are provided to enhance the readability of NASA's FY 2013 Inspector General Act Amendments Report:

Final Management Decision is reached when management evaluates the OIG's findings and recommendations, and determines whether or not to implement a proposed recommendation. If the final management decision is to implement an audit recommendation, a related corrective action plan is developed.

Final Management Action is the point in time when corrective action, taken by management in conjunction with a final management decision, is completed.

Corrective Action consists of remediation efforts on the part of management which are intended to mitigate an audit finding.

Questioned Costs are costs identified by the OIG as being potentially unallowable or unallowable because of: a) a purported violation of law, regulation, contract, grant, cooperative agreement, or other device governing the incurrence of cost; b) a finding that, at the time of the audit, such cost is not supported by adequate documentation, or; c) a finding that the cost incurred for the intended purpose is unnecessary or unreasonable.

Disallowed Costs are questioned costs that management has sustained or agreed should not be charged to the Government.

Funds Put to Better Use **(FPTBU)** represent potential cost savings that could be realized through the implementation of an audit recommendation.

NASA's Audit Follow-up Program

NASA's audit follow-up program is an integral component of the Agency's integrated internal control framework, and is a key element in terms of improving the overall efficiency and effectiveness of NASA's operations and activities. NASA is committed to ensuring timely and responsive final management decisions along with timely and complete final management action on all audit recommendations issued by the NASA OIG. In this regard, NASA has implemented a comprehensive program of audit follow-up intended to ensure that audit recommendations issued by the OIG are resolved and implemented in a timely, responsive, and effective manner.

NASA has designated the Office of Internal Controls and Management Systems (OICMS) as the Agency's office of primary responsibility for policy formulation, oversight, and functional leadership of NASA's audit follow-up program. OICMS implements related program activities through an agency-wide network of Audit Liaison Representatives (ALRs), who, in turn, are responsible for executing program activities at the operating level. This network of ALRs, in conjunction with OICMS' oversight, provides the functional structure to support NASA's audit follow-up program. Program activities are tracked, monitored and reported through the utilization of NASA's Audit and Assurance Information Reporting System (AAIRS). AAIRS is a web-based tracking and reporting tool utilized by OICMS and NASA ALRs to monitor key activities and milestones associated with audits performed by the OIG.

In accordance with requirements delineated in OMB Circular A-50, "*Audit Follow-up*," OICMS monitors audit recommendations issued by the OIG to ensure that a final management decision is reached within six months of the issuance of a final audit report. A final management decision consists of either agreeing to implement an OIG recommendation; agreeing to implement a portion of an OIG recommendation, or; declining to implement an OIG recommendation. In those instances where agreement between the OIG and NASA management cannot be reached, a final management decision will be sought from NASA's Audit Follow-up Official (AFO) within six months of the issuance of a final audit report.

Once a final management decision has been made to either implement or partially implement an OIG audit recommendation, corrective action on the part of management is pursued as rapidly as possible, in accordance with provisions of OMB Circular A-50. In some instances the corrective action associated with a final management decision spans multiple fiscal years due factors such as the complexity of the planned corrective action; or unforeseen delays in the formulation,

review and approval of NASA policies, procedural requirements, or regulations. NASA management continues to aggressively pursue the implementation of agreed-upon corrective action relating to audit recommendations issued by the OIG, in spite of inherent or unforeseen delays in the implementation of associated corrective action.

FY 2013 Audit Follow-up Results

The Inspector General Act Amendments of 1988 require that heads of federal agencies report on actions taken, or remaining to be taken, in response to OIG audit reports containing monetary findings. The amendments also require that management disclose those OIG audit reports for which a final management decision had been made in a prior reporting period, but where final management action is still pending. In addition to the statutory reporting requirements delineated in the Inspector General Act Amendments of 1988, OMB Circular A-50, requires that final management decisions on OIG audit recommendations be made within six months of the issuance of a final audit report. NASA's reporting in conjunction with the requirements of the Inspector General Act Amendments of 1988 and OMB Circular A-50 follows:

1. OIG Audit Reports with Monetary Findings

During FY 2013, the OIG issued no audit reports with monetary benefits of funds put to better use. However, during the prior year (FY 2012), the OIG issued two audit reports containing monetary benefits or funds put to better use (FPTBU) in the amount of $261,487[1] requiring management's disposition during FY 2013 (see Table 1). Monetary benefits in the amount of $44,567 have been dispositioned by management, while management's disposition of the remaining $261,487 is planned for December 2013.

Audit Reports with Monetary Benefits (Disallowed Costs and Funds Put to Better Use)
For the Year Ended September 30, 2013

	Category	Disallowed Costs		Funds to be Put To Better Use	
		Number of Reports	(Dollars)	Number of Reports	(Dollars)
Line 1	Audit reports with monetary benefits issued in FY 2012 that required disposition by management in FY 2013 (prior year carry-over)	2	$261,487	0	$0
Line 2	Plus: Audit reports with monetary benefits issued in FY 2013 that required disposition by management during FY 2013	0	$0	0	$0
Line 3	Total audit reports with monetary benefits (prior year and current year) that required disposition by management in FY 2013 [line 1 + 2]	2	$261,487	0	$0
Line 4	Audit reports with monetary benefits on which management disposition was completed during FY 2013	1	$44,567	0	$0
Line 5	Audit reports with monetary benefits still pending disposition by management at the end of FY 2013 [line3-4] (carry-over into FY 2014)	1	$216,920	0	$0

Table 1

[1] Audit of NASA Grants Awarded to the Philadelphia College Opportunity Resources for Education (IG-12-081; $216,920)
Audit of NASA Grant Awarded to the HudsonAlpha Institute for Biotechnology (IG-12-019; $44,567)

2. OIG Audit Recommendations Open More Than One Year After Report Issuance

As of September 30, 2013, there were 20 OIG audit reports issued in prior fiscal years containing a total of 59 audit recommendations pending final management action more than one year after the issuance of the related OIG audit report (see Table 2). Although these 59 recommendations remain open more than one year after issuance of the respective audit reports, NASA management continues to aggressively pursue related corrective actions. For the majority of these recommendations (36), outstanding corrective actions consist of the implementation of various management oversight, internal monitoring, and compliance review activities. For the balance of these recommendations (23), outstanding corrective actions consist of the completion of policy development and policy revision activities.

By way of comparison, for the fiscal year ended September 30, 2012, there were 15 OIG audit reports containing 38 recommendations on which final management decisions were made but final management action was still pending. For the five year period ended September 30, 2013, the number of OIG audit recommendations pending final management action one year or more after issuance of a final audit report has ranged between 33 and 59.

Summary of OIG Audit Reports Pending Final Management Action
One Year or More After Issuance of a Final Report
(As of September 30, 2013)

Report No. (Report Date)	Report Title	No. of Recommendations		
		Open	Closed	Total
IG-09-017 (7/28/2009)	*Review of the Space Flight Awareness Honoree Launch Conference Event*	1	0	1
IG-10-013 (5/13/2010)	*Review of the Information Technology Security of the Internet Protocol Operational Network (IONet)*	2	0	2
IG-11-016 (3/15/2011)	*Preparing for the Space Shuttle Program's Retirement: Review of NASA's Controls over Public Sales of Space Shuttle Property*	1	6	7
IG-10-019 (9/14/2010)	*Information Technology Security: Improvements Needed in NASA's Continuous Monitoring Processes*	2	0	2
IG-11-024 (8/4/2011)	*NASA Infrastructure and Facilities: Assessment of Data Used to Manage Real Property Assets*	1	2	3
IG-11-004 (12/13/2010)	*Review of the Jet Propulsion Laboratory's Occupational Safety Program*	1	14	15
IG-11-017 (3/28/2011)	*Inadequate Security Practices Expose Key NASA Network to Cyber Attack*	1	2	3
IG-11-023 (8/10/2011)	*NASA's Payments for Academic Training*	6	0	6
IG-11-026 (9/12/2011)	*NASA's Grant Administration and Management*	5	4	9
IG-12-006 (12/5/2011)	*NASA Faces Significant Challenges in Transitioning to a Continuous Monitoring Approach for Its Information Technology Systems*	7	0	7
IG-12-008 (12/19/2011)	*NASA's Infrastructure and Facilities: An Assessment of the Agency's Real Property Master Planning*	1	2	3
IG-12-010 (2/16/2012)	*Audit of NASA's Purchase and Travel Card Programs*	2	13	15
IG-12-012 (3/6/2012)	*Review of NASA's Lessons Learned Information System*	3	1	4
IG-12-013 (3/1/2012)	*Audit of NASA's Process for Transferring Technology to the Government and Private Sector*	2	4	6
IG-12-015 (5/1/2012)	*NASA's Efforts to Identify, Report, and Recapture Improper Payments*	4	5	9
IG-12-016 (6/22/2012)	*Audit of NASA Grants Awarded to the Alabama Space Science Exhibit Commission's U.S. Space and Rocket Center*	1	0	1

IG-12-017 (8/7/2012)	*Review of NASA's Computer Security Incident Detection and Handling Capability*	3	0	3
IG-12-018 (7/26/2012)	*Audit of NASA Grants Awarded to the Philadelphia College Opportunity Resources for Education*	4	4	8
IG-12-019 (8/3/2012)	*Audit of NASA Grant Awarded to the HudsonAlpha Institute for Biotechnology*	4	4	8
IG-12-020 (8/9/2012)	*NASA's Infrastructure and Facilities: An Assessment of the Agency's Real Property Leasing Practices*	8	0	8
20	**Totals**	**59**	**61**	**120**

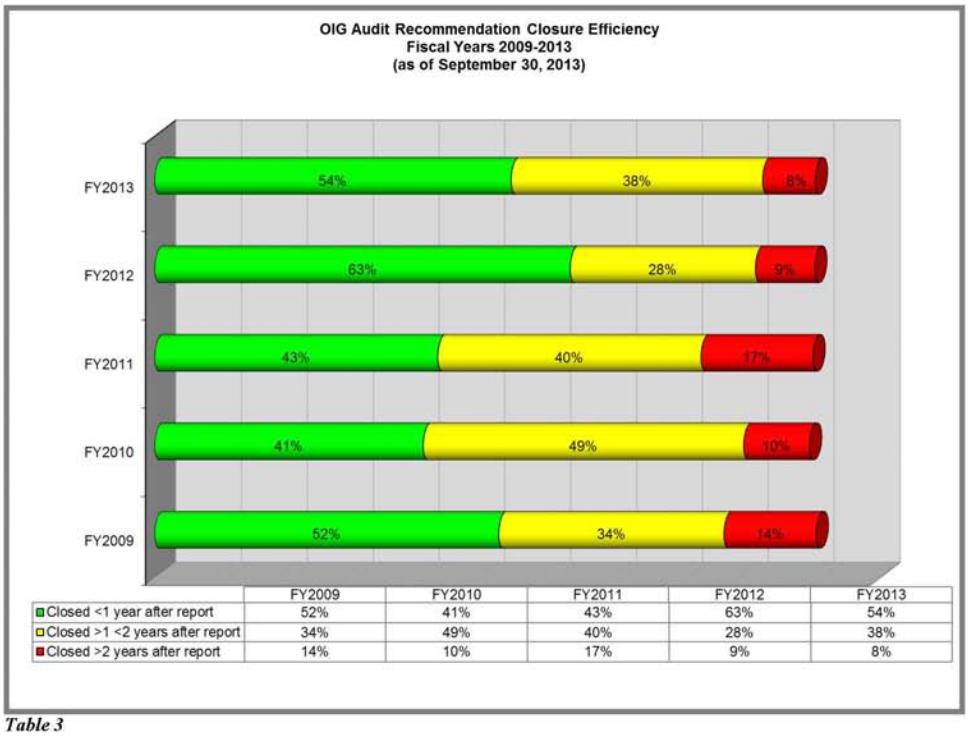
Table 2

3. Final Management Decisions Not Made Within Six Months of a Report Date
During FY 2013, the OIG issued 20 reports containing 142 recommendations addressed to NASA which required a final management decision within six months of the respective final report dates. A final management decision was made on all 142 audit recommendations issued in FY 2013[2]. For comparative purposes, for the fiscal year ended September 30, 2012, NASA reported no outstanding final management decisions pending more than six months after the issuance of a final OIG audit report. For the five-year period ended September 30, 2013, all final management decisions were made within six months of the issuance of a final OIG audit report.

4. Audit Recommendation Closure Efficiency
During FY 2013, a total of 157 OIG-issued audit recommendations (including 152 recommendations issued in prior fiscal years) were closed based on the implementation of final management action. Of the 157 recommendations closed in FY 2013, 54 percent (85 recommendations) were closed within one year of the issuance of the associated audit report, while 92 percent (145 recommendations) were closed within two years of the issuance of the associated audit report (see Table 3).

For comparative purposes, during FY 2012, a total of 103 OIG-issued audit recommendations (including 80 recommendations issued in prior fiscal years) were closed based on the implementation of final management action. Of the 103 recommendations closed in FY 2012, 63 percent (65 recommendations) were closed within one year of the issuance of the associated audit report, while 91 percent (94 recommendations) were closed within two years of the issuance of the associated audit report. For the five year period ended September 30, 2013, an average of 51 percent of OIG-issued audit recommendations were closed within one year of the final issance of the assocated audit report, while an average of 88 percent of OIG-issued audit recommendations were closed within two years of the issuance of the associated audit report.

[2] "*NASA's Environmental Remediation Efforts at the Santa Susana Field Laboratory*" (IG-13-007), dated February 14, 2013. The OIG recommended that NASA reexamine current plans for site clean-up. While NASA appreciates the OIG's recommendation, the Agency continues to work within the requirements of a 2010 Administrative Order of Consent (AOC) to achieve both cost avoidance and protection of cultural and natural resources at the site. The Agency's position is that decisive action has been taken and/or planned in accordance with the requirements of the AOC and the recommendation is therefore closed; however, for the OIG the recommendation remains open.



	FY2009	FY2010	FY2011	FY2012	FY2013
Closed <1 year after report	52%	41%	43%	63%	54%
Closed >1 <2 years after report	34%	49%	40%	28%	38%
Closed >2 years after report	14%	10%	17%	9%	8%

Table 3

Although NASA continues to face myriad challeges in the pursuit of implementing corrective actions associated with OIG audit recommendations in an efficient and effective manner, NASA management remains committed to the improvement of Agency operations and activities as identified by the OIG in their audit reports and associated recommendations.

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Improper Payments Information Act (IPIA) Assessment

The National Aeronautics and Space Administration (NASA) is dedicated to reducing fraud, waste, and abuse by adequately reviewing and reporting programs susceptible to improper payments in accordance with the Office of Management and Budget (OMB) Circular A-123 *Management's Responsibility for Internal Control, Appendix C, Requirements for Effective Measurement and Remediation of Improper Payments*. To improve the integrity of the Federal government's payments and the efficiency of its programs and activities, Congress enacted the Improper Payments Information Act (IPIA) of 2002 (Public Law No. 107-300). The IPIA contains requirements in the areas of improper payment identification and reporting. It requires Agency heads to annually review all programs and activities, identify those that may be susceptible to significant improper payments, estimate annual improper payments in susceptible programs and activities, and report the results of their improper payment activities.

On July 22, 2010, the President signed into law the Improper Payments Elimination and Recovery Act (IPERA; Pub. L. No. 111-204). As amended by IPERA (Section II.5.8 Reporting Details), IPIA generally repealed the Recovery Auditing Act (Section 831, Defense Authorization Act, for fiscal year (FY) 2002; Pub. Law No. 107-107). Subsequently, OMB issued Memorandum M-11-16 modifying Circular A-123 Appendix C, Part I and Part II (which was issued in August 2006 as OMB Memorandum M-06-23). OMB Memorandum M-11-16 requires each Executive branch agency to review all of its programs and activities to identify those susceptible to significant improper payments. OMB defines significant improper payments as gross annual improper payments (i.e., the total amount of overpayments plus underpayments) in the program exceeding (1) both 2.5 percent of program outlays and $10,000,000 of all program or activity payments made during the fiscal year reported or (2) $100,000,000 (regardless of the improper payment percentage of total program outlays).

NASA's programs are authorized by law. The annual NASA Planning, Programming, Budgeting, and Execution process (PPBE) results in the development of NASA's budget request to Congress which is considered part of the President's budget request. NASA and OMB assure that the budget request is consistent with NASA's authorization. The NASA budget submission includes a detailed presentation of the amounts requested by account; mission, theme, program, and project reporting attribute (PRA). Once NASA's annual appropriation is enacted, program codes are established in NASA's financial management system of record, and funds are distributed to the programs consistent with the appropriations. The NASA IPIA program focuses on programs as defined in NASA's financial management system.

NASA has diligently met IPIA program compliance by executing OMB-compliant risk assessments, reviewing and updating NASA payment process documentation, selecting OMB-compliant statistical samples for testing, performing comprehensive test procedures, reporting results in the annual Agency Financial Report (AFR) formerly the Performance and Accountability Report, and documenting the IPIA review process and

results. This is evidenced by NASA's extensive improper payment test results. In FY 2012, NASA found no improper payments and the NASA Office of Inspector General (OIG) concluded that NASA complied with IPERA.[1] NASA has reviewed its programs annually for seven years and has not identified significant improper payments for any of its programs.

The results of our improper payment reviews of disbursements made during FY 2010 – FY 2012 have demonstrated that no NASA programs were susceptible to significant improper payments during the past three years. The risk analysis included an evaluation of the following risk factors: disbursement materiality (set at $80M), a review and evaluation of recent findings from Government Accountability Office (GAO) and OIG NASA audit reports, and programs with payments made to private individuals and/or beneficiaries. NASA's risk assessment strategy is illustrated in the table below titled "NASA's Risk Assessment Strategy."

NASA's Risk Assessment Strategy

Determine Scope	Identify Programs Eligible for Assessment	Analyze Risk Conditions	Prepare Risk Assessment
• Identified 152 distinct programs encompassing $19.5 billion in FY 2012 disbursements • Set materiality level of programs in-scope at >$80 million	• Identified 46 programs within assessment scope encompassing $17.8 billion in FY 2012 disbursements	• Evaluated prior year audit reports, findings and recommendations • Evaluated payments to beneficiaries and private sector individuals risk conditions	• Updated risk assessment report based on information gathered from NASA financial management reports and independent reviews • Identified no NASA programs susceptible to a high risk of improper payments

The results of the FY 2013 risk assessment process, along with NASA's history of positive improper payment testing results, concluded that once again, none of NASA's programs are susceptible to a risk of significant improper payments.

[1] NASA'S Compliance with the Improper Payment Information Act for Fiscal Year 2012 (IG-13-011) http://oig.nasa.gov/audits/reports/FY13/IG-13-011.pdf

Recapture Audit

On July 22, 2010, the President signed into law the Improper Payments Elimination and Recovery Act (IPERA; Pub. L. No.111-204). IPERA requires all federal agencies to conduct payment recapture audits. NASA continues to perform recapture audits as part of its overall program to ensure effective internal control over payments. In FY 2013 NASA completed recapture audits of FY 2011 and FY 2012 disbursements.

In accordance with the amended Office of Management and Budget (OMB) Circular A-123, Appendix C guidance, agencies may determine to exclude classes of contracts and contract payments from recapture audit activities if the Agency determines that the recapture audits are inappropriate or not a cost-effective method for identifying and recovering improper payments. NASA employs the Defense Contract Audit Agency (DCAA) to perform auditing procedures on cost-type contracts. Performing a separate recapture audit on these cost-type contracts would be duplicative and not cost-effective. In addition, the contractual terms of NASA's cost-type contracts provides for audit access only by the DCAA. Increasing audit access would require contract modifications for existing contracts, which would likely result in increased costs. Consequently, NASA does not consider it cost-effective to conduct payment recapture audits for cost-type contracts and does not include cost-type contracts in its recapture audits.

NASA engaged an industry leading consulting firm to perform recapture auditing under a contingency based contract. The recapture audit contractor performed exhaustive database analyses and comparisons along with account statement reviews to determine potential recapture amounts such as overpayments and credits not taken. All recapture amounts were sent for collection by NASA's centralized disbursing function following the US treasury guidelines. All amounts not collected within 90 days were sent to the US treasury and determined uncollectible. This year, recapture audits for FY 2011 and FY 2012 disbursements were completed and the results are listed in the table titled "Payment Recapture Audit Reporting." In FY 2011 a total of eight (8) recapture amounts were identified, of which, five (5) were due to duplicate invoices and three (3) were due to credit memorandums not received or not posted. In FY 2012, a total of six (6) recapture amounts were identified; all of which were due to credit memorandums not posted. There are no systemic problems which caused these overpayments. However, NASA will remain vigilant in its review of internal controls, post-payment audits and internal audits.

In addition to the Recapture Audit activities listed above, NASA Centers and the Office of the Inspector General (OIG) may engage in other recapture activities which can result in the identification of additional overpayments. Examples of such activities include Agency post-payment reviews/audits, single audit and self-reported overpayments. The OIG provided information pertaining to OIG Audit Number A-12-009-00, "Audit of NASA Grant Awarded to Hudson Alpha Institute for Biotechnology," Report Number IG-12-019, issued on August 3, 2012 which identified an FY 2012 overpayment of $44,567 which has been recovered.

Payment Recapture Audit Reporting

Type of Payment	Amount Subject to Review for Reporting FY 2011-12	Actual Amount Reviewed and Reported FY 2011-12	Amount Identified for Recovery FY 2011-12	Amount Recovered FY 2011-12	% of Amount Recovered out of Amount Identified FY 2011-12	Amount Outstanding FY 2011-12	% of Amount Outstanding out of Amount Identified FY 2011-12	Amount Determined Not to be Collectable FY 2011-12	% of Amount Determined Not to be Collectable out of Amount Identified FY 2011-12	Amounts Identified for Recovery (2010 + PYs)	Amounts Recovered (2010 + PYs)	Cumulative Amounts Identified for Recovery (2012 + PYs)	Cumulative Amounts Recovered (2012 + PYs)	Cumulative Amounts Outstanding (2012 + PYs)	Cumulative Amounts Determined Not to be Collectable (2012 + PYs)
Fixed Price Contract	$7,480,718,409	$7,480,718,409	$40,269	$39,351	98%	$918	2%	$0	0%	$245,228	$222,081	$285,497**	$261,432**	$24,065**	$23,147*

**Total cumulative amounts began with FY 2004.
*NASA considers these four (4) claims totaling $23,147 as uncollectible as they have been forwarded to the Treasury.

Payment Recapture Audit Targets

Type of Payment	CY Amount Identified	CY Amount Recovered	CY Recovery Rate (Amount Recovered/ Amount Identified)	CY + 1 Recovery Rate Target	CY + 2 Recovery Rate Target	CY + 3 Recovery Rate Target
Fixed Price Contracts	$40,269*	$39,351*	98%	98%**	98%**	98%**

*CY Amount reflects two (2) years; FY 2011 & FY 2012.
**Recovery Rate Target is based on the cumulative amounts recovered/cumulative amounts identified, but the target will not be less than 90%.

Aging of Outstanding Overpayments

Type of Payment	CY Amount Outstanding (0-6 months)	CY Amount Outstanding (6 months to 1 year)	CY Amount Outstanding (over 1 year)
Fixed Price Contracts	$1,009*	$0	$0

* Includes penalties and interest.

Disposition of Recaptured Funds

Type of Payment	Agency Expenses to Administer the Program	Payment Recapture Auditor Fees	Financial Management Improvement Activities	Original Purpose	Office of Inspector General	Returned to Treasury
Fixed Price Contracts	$0*	$8,775**	$0	$39,066	$0	$285

*NASA believes these administrative costs to be marginal and currently has not accumulated a cost figure.
**Recapture Auditor Fees for FY 2011 & FY 2012 only.

Overpayments Recaptured Outside of Payment Recapture Audits

Source of Recovery	Amount Identified (CY)	Amount Recovered (CY)	Amount Identified (PY)	Amount Recovered (PY)	Cumulative Amount Identified (CY+PYs)	Cumulative Amount Recovered (CY+PYs)
OIG	$0	$44,567*	$44,567	$0	$44,567	$44,567

*Total amount recovered is $44,567. The amount collected was $34,169 and the remaining amount of $10,398 was offset as an underpayment.

NASA has taken steps through improper payment reviews and recapture audits to continue holding Agency managers accountable for reducing and recovering improper payments. The recapture audit process is monitored by the Office of the Chief Financial Officer to ensure compliance with NASA's Recapture Audit Guidance. In addition, all collection and disbursement functions are centralized which ensures consistent application of the control environment and reduction of improper payment risk. NASA has the infrastructure and information technology in place to reduce improper payments. There are no statutory or regulatory barriers limiting NASA's ability to reduce improper payments.

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Schedule of Spending

The Schedule of Spending (SOS) presents an overview of how and where agencies are spending (obligating) money for the reporting period. The data used to populate the Schedule of Spending is the same underlying data that is used to populate the Statement of Budgetary Resources (SBR). The SOS table presents budgetary data in general terms, but corresponds to amounts shown on the SBR. See table below:

Schedule of Spending Line Item Title		Statement of Budgetary Resources Line Item Title
Total Resources	→	Total Budgetary Resources
Total Amounts Agreed to be Spent	→	Obligations Incurred
Total Spending	→	Gross Outlays

USASpending.gov is a federal website designed in accordance with the Federal Funding Accountability and Transparency Act of 2006. The information for this website is gathered from the Federal Procurement Data System (FPDS) which contains information about Federal Contracts, and the Federal Assistance Awards Data System (FAADS) which contains information about federal financial assistance such as grants, loans, insurance and direct subsidies. Information from these two systems is also captured by the Agency's Financial System through PRISM, which is an acquisition management system used by agencies government wide. The Agency's financial system is used to generate the SBR. NASA conducts a quarterly validation of procurement information reported on USASpending.gov.

(In Millions of Dollars)	2013	2012
Section I: What Money is Available to Spend?		
Total Resources	$ 20,755	$ 21,618
Less Amount Available but Not Agreed to be Spent	903	821
Less Amount Not Available to be Spent	141	112
Total Amounts Agreed to be Spent	**$ 19,711**	**$ 20,685**
Section II: How was the Money Spent?		
Space Operations Mission		
Personnel compensation and benefits	$ 342	$ 368
Contractual services and supplies	3,408	4,033
Acquisition of assets	18	31
Grants and fixed charges	19	17
Other	1	5
Total Spending	3,788	4,454
Science Mission		
Personnel compensation and benefits	$ 306	$ 315
Contractual services and supplies	3,489	3,532
Acquisition of assets	54	55
Grants and fixed charges	564	559
Other	—	1
Total Spending	4,413	4,462

(In Millions of Dollars)	2013	2012
Section II: How was the Money Spent? (ctd.)		
Exploration Mission		
Personnel compensation and benefits	$ 435	$ 433
Contractual services and supplies	3,499	3,058
Acquisition of assets	25	23
Grants and fixed charges	69	80
Other	—	1
Total Spending	4,028	3,595
Aeronautics Mission		
Personnel compensation and benefits	$ 191	$ 195
Contractual services and supplies	276	303
Acquisition of assets	24	23
Grants and fixed charges	31	27
Other	1	1
Total Spending	523	549
Cross-Agency Mission		
Personnel compensation and benefits	$ 1,192	$ 1,211
Contractual services and supplies	3,719	3,478
Acquisition of assets	87	111
Grants and fixed charges	37	68
Other	36	10
Total Spending	5,071	4,878
Education Mission		
Personnel compensation and benefits	$ 7	$ 7
Contractual services and supplies	20	28
Grants and fixed charges	109	129
Other	—	—
Total Spending	136	164
Office of Inspector General		
Personnel compensation and benefits	$ 30	$ 32
Contractual services and supplies	6	6
Acquisition of assets	1	—
Total Spending	37	38
Space Technology Mission		
Personnel compensation and benefits	$ 124	$ 103
Contractual services and supplies	385	124
Acquisition of assets	5	3
Grants and fixed charges	20	2
Total Spending	534	232
Construction and Environmental Compliance and Restoration		
Personnel compensation and benefits	$ 166	$ 160
Contractual services and supplies	207	218
Acquisition of assets	—	—
Total Spending	373	378
Other		
Personnel compensation and benefits	$ 18	$ 19
Contractual services and supplies	939	760
Acquisition of assets	14	29
Grants and fixed charges	2	3
Other	(3)	1
Total Spending	970	812
Total Spending	**$ 19,873**	**$ 19,562**
Section III: Who did the Money go to?		
Federal	$ 1,359	$ 1,319
Non-Federal	18,352	19,366
Total Amounts Agreed to be Spent	**$ 19,711**	**$ 20,685**

Summary of Financial Statement Audit and Management Assurances

The following tables summarize the Agency's FY 2013 Financial Statement Audit and Management Assurances. Table 1 summarizes the status of prior year — FY 2012 material weaknesses identified, if any by the Financial Statement Auditor. Table 2 summarizes the status of prior year material weaknesses, if any identified by NASA Management.

Table 1: Summary of Financial Statement Audit

Audit Opinion	Unmodified				
Restatement	No				
Material Weaknesses	Beginning Balance	New	Resolved	Consolidated	Ending Balance
None	0	0	0	0	0
Total Material Weaknesses	0	0	0	0	0

Table 2: Summary of Management Assurances

Effectiveness of Internal Control over Financial Reporting (FMFIA 2)						
Statement of Assurance	Unqualified					
Material Weaknesses	Beginning Balance	New	Resolved	Consolidated	Reassessed	Ending Balance
None	0	0	0	0	0	0
Total Material Weaknesses	0	0	0	0	0	0
Effectiveness of Internal Control over Operations (FMFIA 2)						
Statement of Assurance	Unqualified					
Material Weaknesses	Beginning Balance	New	Resolved	Consolidated	Reassessed	Ending Balance
None	0	0	0	0	0	0
Total Material Weaknesses	0	0	0	0	0	0
Conformance with Financial Management System Requirements (FMFIA 4)						
Statement of Assurance	Systems conform					
Non-Conformances	Beginning Balance	New	Resolved	Consolidated	Reassessed	Ending Balance
None	0	0	0	0	0	0
Total Non-Conformances	0	0	0	0	0	0
Compliance with Federal Financial Management Improvement Act (FFMIA)						
	Agency			Auditor		
1. System Requirements	No noncompliance noted			No noncompliance noted		
2. Accounting Standards	No noncompliance noted			No noncompliance noted		
3. USSGL at Transaction Level	No noncompliance noted			No noncompliance noted		

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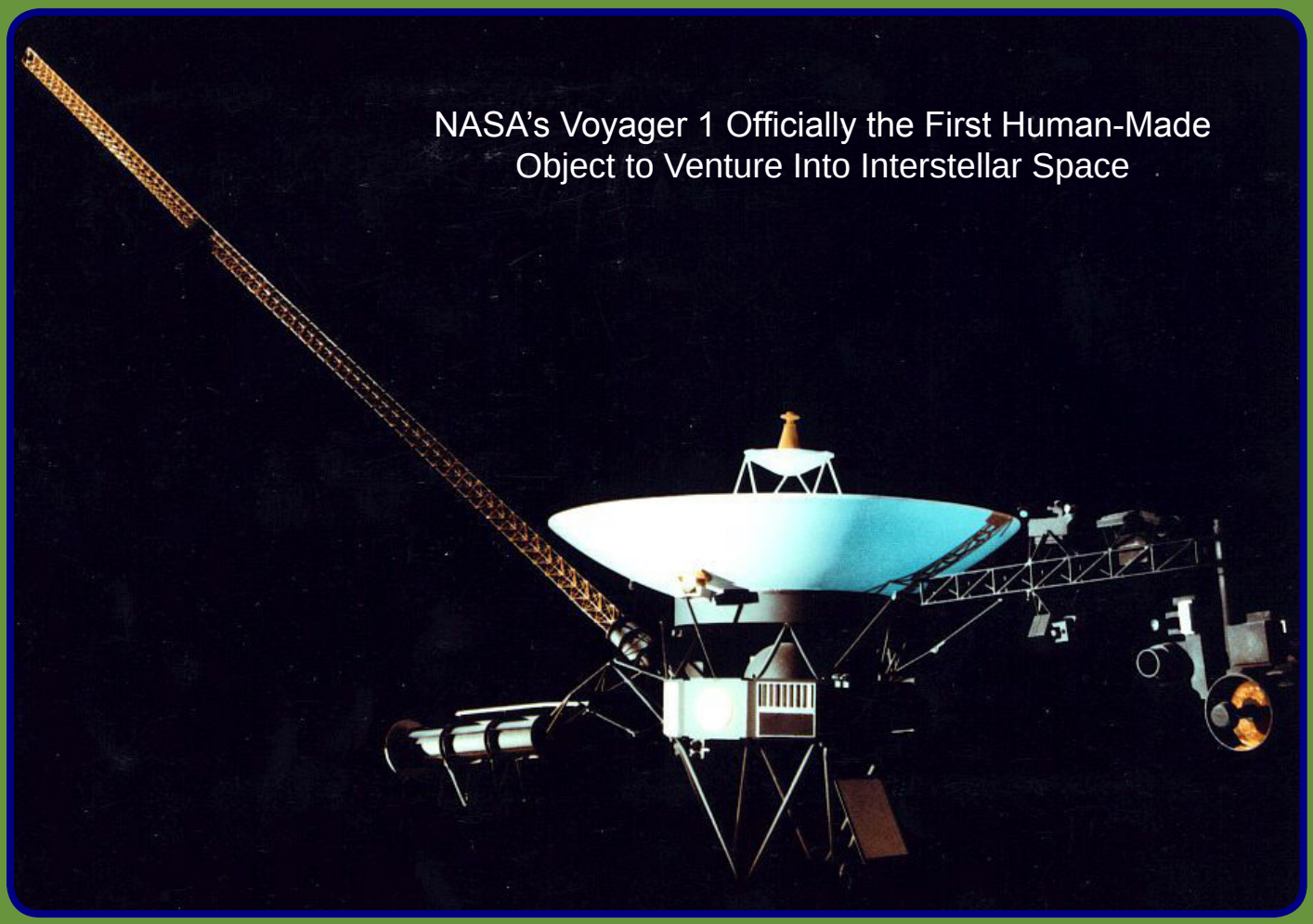

The 36-year-old probe is about 12 billion miles (19 billion kilometers) from our sun. New and unexpected data indicate Voyager 1 has been traveling for about one year through plasma, or ionized gas, present in the space between stars. A report on the analysis of this new data is published in the journal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

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