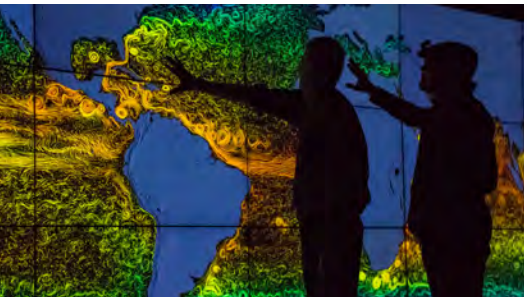
National Aeronautics and Space Administration

2016

AGENCY FINANCIAL REPORT



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Cover Image Captions and Credits

Front Cover:

Outside Front Main Image: Artist's concept. **Photo credit:** NASA

Outside Front Bottom Images (left to right):

Leonardo DiCaprio visited Goddard to discuss Earth science with Piers Sellers. **Photo credit:** NASA/Goddard/Rebecca Roth

NASA Twins Study investigators are looking for metabolic changes in retired astronaut Scott Kelly and studying how it correlates to the food he ate during the One-Year Mission and Twins Study. He is photographed with oranges, lemons, and grapefruits floating around him on the International Space Station. **Photo credit:** NASA

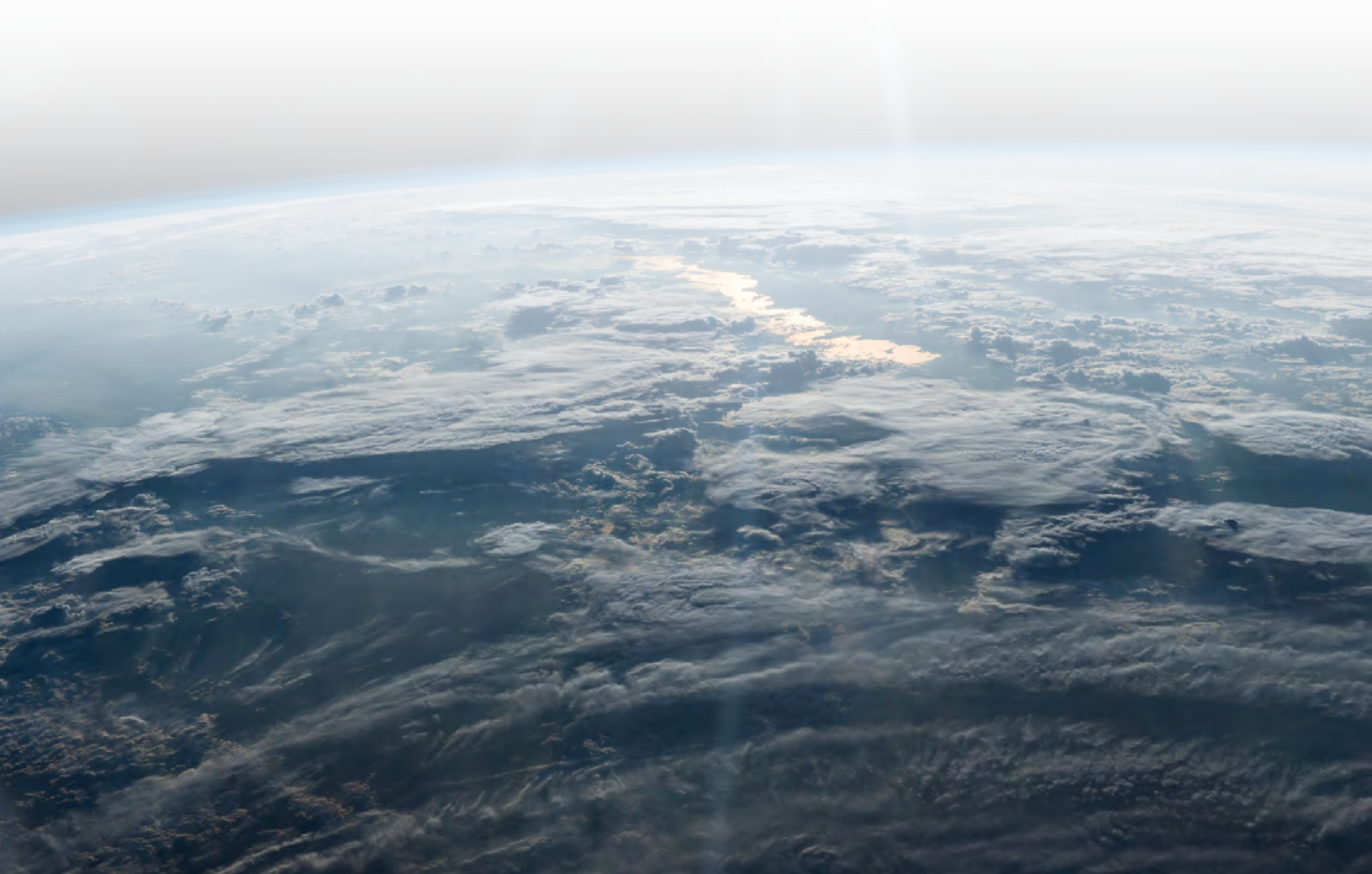
Attendees are seen as they listen to speakers at the NASA exhibits during Sneak Peek at the USA Science and Engineering Festival, Friday, April 15, 2016 at the Walter E. Washington Convention Center in Washington, DC. **Photo credit:** NASA/Joel Kowsky

Inside Front:

This stunning Earth image taken from the International Space Station looks from Northwestern China on the bottom into eastern Kazakhstan. The large lake in Kazakhstan with golden sun glint is named Lake Balkhash. It is one of the largest lakes in Asia and is the 15th largest lake in the world. The lake is fed by seven rivers. **Photo credit:** NASA

Rear Cover:

NASA astronauts Kate Rubins (left) and Jeff Williams (right) prepare to grapple the SpaceX Dragon supply spacecraft from aboard the International Space Station. **Photo credit:** NASA



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Message from the Administrator

November 15, 2016

I am proud to present NASA's Fiscal Year (FY) 2016 Agency Financial Report, which provides information on our financial performance and insight into our stewardship of taxpayer dollars and the resources entrusted to NASA. This report also summarizes our progress toward achieving our Journey to Mars and NASA's Mission to *drive advances in science, technology, aeronautics, and space exploration to enhance knowledge, education, innovation, economic vitality, and stewardship of Earth.*

Efficient and effective financial management makes our mission possible. We received an unmodified audit opinion on our FY 2016 financial statements. The report of the independent auditors is included in this Agency Financial Report. I am able to provide reasonable assurance that the performance and financial information in this report is reliable and complete.

One of our long-term goals is to send humans to Mars, and to enable that goal we are implementing a sustainable long-term plan, and developing new systems for the human exploration of deep space. In FY 2016, for example, NASA accomplished the second and final qualification ground test for the Space Launch System (SLS) booster. This was the last full-scale test for the booster before SLS's first uncrewed test flight with NASA's Orion spacecraft in late 2018, a key milestone on the Agency's Journey to Mars. With support from the Exploration Ground Systems program, these new capabilities will carry astronauts into deep space.

Also paving the way for future missions, NASA astronaut Scott Kelly completed a one-year mission on the International Space Station in FY 2016, along with Russian cosmonaut Mikhail Kornienko. The one-year crew mission was the latest step in the station's role as a platform for preparing humanity for exploration into deeper space.

Our human space exploration efforts are part of a balanced portfolio of programs the Agency is undertaking that enable the U.S. to lead the world in aerospace research, development, and exploration. Our robotic explorers also continued to astound in FY 2016, including the Juno mission's arrival at Jupiter. We added to our scientific and exploration capabilities by launching several missions, including the Origins Spectral Interpretation Resource Identification Security–Regolith Explorer mission (OSIRIS-REx), the Asteroid Sample Return mission and the Jason-3 mission, that measures sea-level variations over the global ocean.

NASA's mission success is thanks to our multi-disciplinary team of diverse, talented people across our Centers. We are committed to nurturing an innovative environment that fosters teamwork and excellence. For the fourth year in a row, employees named NASA the Best Place to Work in the Federal Government among large agencies.

As shown in this report, we strive to put your tax dollars to efficient and innovative use. In the year ahead, NASA will continue to push the boundaries of exploration. Along the way, we will make new scientific discoveries, develop new technologies and capabilities, and deliver tangible benefits to the public. This report provides additional details on these achievements. If you would like more information on our progress toward achieving our strategic goals, I invite you to read our Annual Performance Report, which will be released concurrently with NASA's Budget Estimates in calendar year 2017.

Charles F. Bolden, Jr.
Administrator

Section 1

Management's Discussion and Analysis

NASA Administrator Charles Bolden, center, answers questions along with David Melcher, CEO of the Aerospace Industry Association (AIA), left, and Jaiwon Shin, Associate Administrator for NASA's Aeronautics Research Mission Directorate, right, during a press conference, Monday, Feb. 29, 2016 at Ronald Reagan Washington National Airport in Arlington, VA. Administrator Bolden announced the award of a contract for the preliminary design of a "low boom" flight demonstration aircraft as part of NASA's New Aviation Horizons initiative that was introduced in the Agency's Fiscal Year 2017 budget request. **Photo credit:** NASA/Joel Kowsky

NASA astronaut Scott Kelly is seen inside a Soyuz simulator at the Gagarin Cosmonaut Training Center (GCTC), Wednesday, March 4, 2015, in Star City, Russia. Kelly, along with Expedition 43 Russian cosmonaut Mikhail Kornienko of the Russian Federal Space Agency (Roscosmos), and Russian cosmonaut Gennady Padalka of Roscosmos were at GCTC for the second day of qualification exams in preparation for their launch to the International Space Station onboard a Soyuz TMA-16M spacecraft from the Baikonur Cosmodrome in Kazakhstan at 3:42 p.m. EST, March 27 (March 28, Kazakh time). As the one-year crew, Kelly and Kornienko returned to Earth on Soyuz TMA-18M in March 2016. **Photo credit:** NASA

Welcome to NASA

NASA produces an Agency Financial Report (AFR) and Annual Performance Report (APR). NASA will publish its Fiscal Year (FY) 2016 APR concurrently with the President's Budget Request and will post it on NASA's Web site at http://www.nasa.gov.

This FY 2016 AFR provides an overview of NASA's major programmatic and financial results for FY 2016. It integrates financial and program performance to demonstrate stewardship and accountability and highlights FY 2016 achievements.

NASA demonstrates stewardship of its resources and accountability for results through compliance with the Chief Financial Officers Act (CFO Act) and the Government Performance and Results Act Modernization Act of 2010 (GPRAMA). Financial aspects of the Agency's business operations are accounted for according to U.S. Generally Accepted Accounting Principles (GAAP). GAAP, for Federal entities, are the standards prescribed by the Federal Accounting Standards Advisory Board (FASAB).

NASA presents both performance and financial results of operations by strategic goal. Highlights of key program activities contributing to each strategic goal are provided in the Mission Performance discussion (starting on page 13). A high-level summary of the linkage between program results and the cost of operations is provided in the Statement of Net Cost (SNC), which can be found in the Financial section (starting on page 49). The SNC presents comparative net cost of operations during FY 2016 and FY 2015 by strategic goal and for the Agency as a whole. In addition, the Financial Highlights section explains any significant changes in NASA's financial condition from FY 2015 to FY 2016.

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 the Office of Management and Budget's (OMB) Circular A-123, *Management's Responsibility for Enterprise Risk Management and Internal Control.* OMB Circular A-123 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 2016 and FY 2015 financial statements, the related independent auditor's audit opinion, and other information. The FY 2016 AFR can be found on NASA's Web site at: http://www.nasa.gov/news/budget/.

A United Launch Alliance Atlas V rocket carrying Orbital ATK's Cygnus spacecraft on a resupply mission to the International Space Station lifts off from Space Launch Complex 41 on Cape Canaveral Air Force Station in Florida at 11:05 p.m. EDT on March 22, 2016. **Photo credit:** NASA

Vision and Mission

Our Vision

We reach for new heights and reveal the unknown for the benefit of humankind.

Our Mission

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

Core Values

NASA's tradition of excellence is rooted in the four uncompromising shared core values of safety, teamwork, excellence, and integrity as well as the firm belief that we refuse to be deterred by failure.

Safety

Teamwork

Excellence

Integrity

NASA's Vision, Mission and Core Values are established in the Strategic Plan which can be found on NASA's website at: https://www.nasa.gov/sites/default/files/files/FY2014_NASA_SP_508c.pdf .

NASA's Three Strategic Goals are:

1. Expand the frontiers of knowledge, capability, and opportunity in space.
2. Advance understanding of Earth and develop technologies to improve the quality of life on our home planet.
3. Serve the American public and accomplish our Mission by effectively managing our people, technical capabilities, and infrastructure.

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

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

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

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

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

FY 2016 - FY 2017 Agency Priority Goals

NASA developed four Agency priority goals for FY 2016 - FY 2017, consistent with the requirements of GPRAMA. The statements for each FY 2016 - FY 2017 Agency priority goal are in the following graphic. More information is available at: http://www.performance.gov/agency/national-aeronautics-and-space-administration?view=public#overview.

Human Exploration and Operations, Exploration Systems Development:

Achieve critical milestones in development of new systems for the human exploration of deep space. By September 30, 2017, NASA will have begun integration and testing of the Exploration Mission (EM)-1 Orion Crew Module (CM), including the first power-on of the vehicle; delivered all four EM-1 Space Launch System (SLS) Core Stage RS-25 engines to the Michoud Assembly Facility in preparation for integration into the Core Stage; and completed construction of Exploration Ground Systems (EGS) Pad B.

Human Exploration and Operations, Commercial Crew Program:

Facilitate the development of and certify U.S. industry-based crew transportation systems while maintaining competition, returning International Space Station crew transportation to the United States. By September 30, 2017, the Commercial Crew Program (CCP), along with its industry partners, will make measurable technical and programmatic progress toward the certification of commercial crew transportation systems, including the completion of at least one Design Certification Review.

Human Exploration and Operations, International Space Station Program:

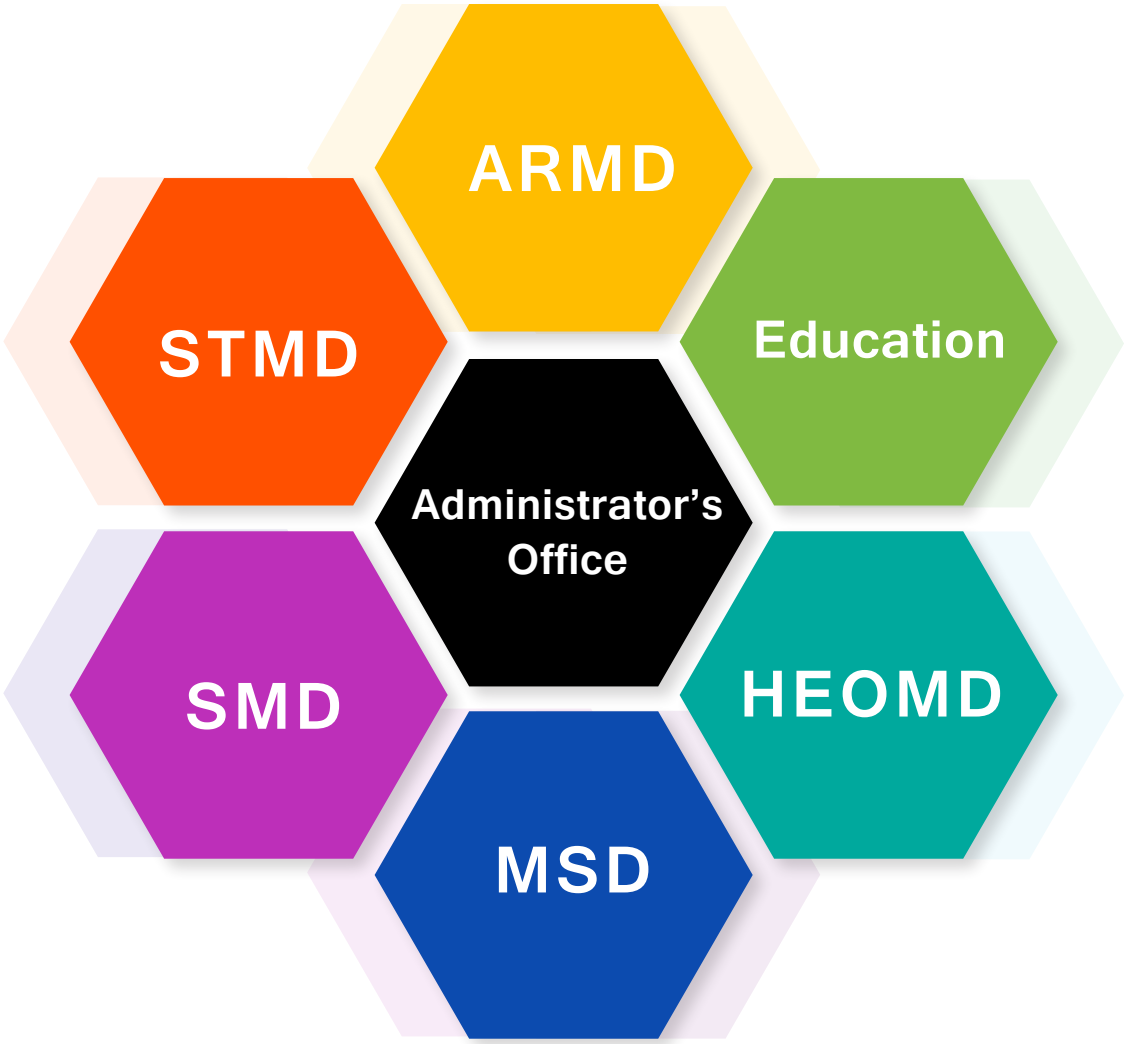
Increase the occupancy of the International Space Station's (ISS) internal and external research facilities by adding new instruments and capabilities. By September 30, 2017, NASA will increase the occupancy of the ISS internal and external research facility sites with science and technology payload hardware to 75 percent.

Science, James Webb Space Telescope Program:

Revolutionize humankind's understanding of the Cosmos and humanity's place in it. By October 2018, NASA will launch the James Webb Space Telescope (Webb). To enable this launch date, NASA will complete the testing of the Webb Optical Telescope Element plus Integrated Science Instrument Module by September 30, 2017.

Organization

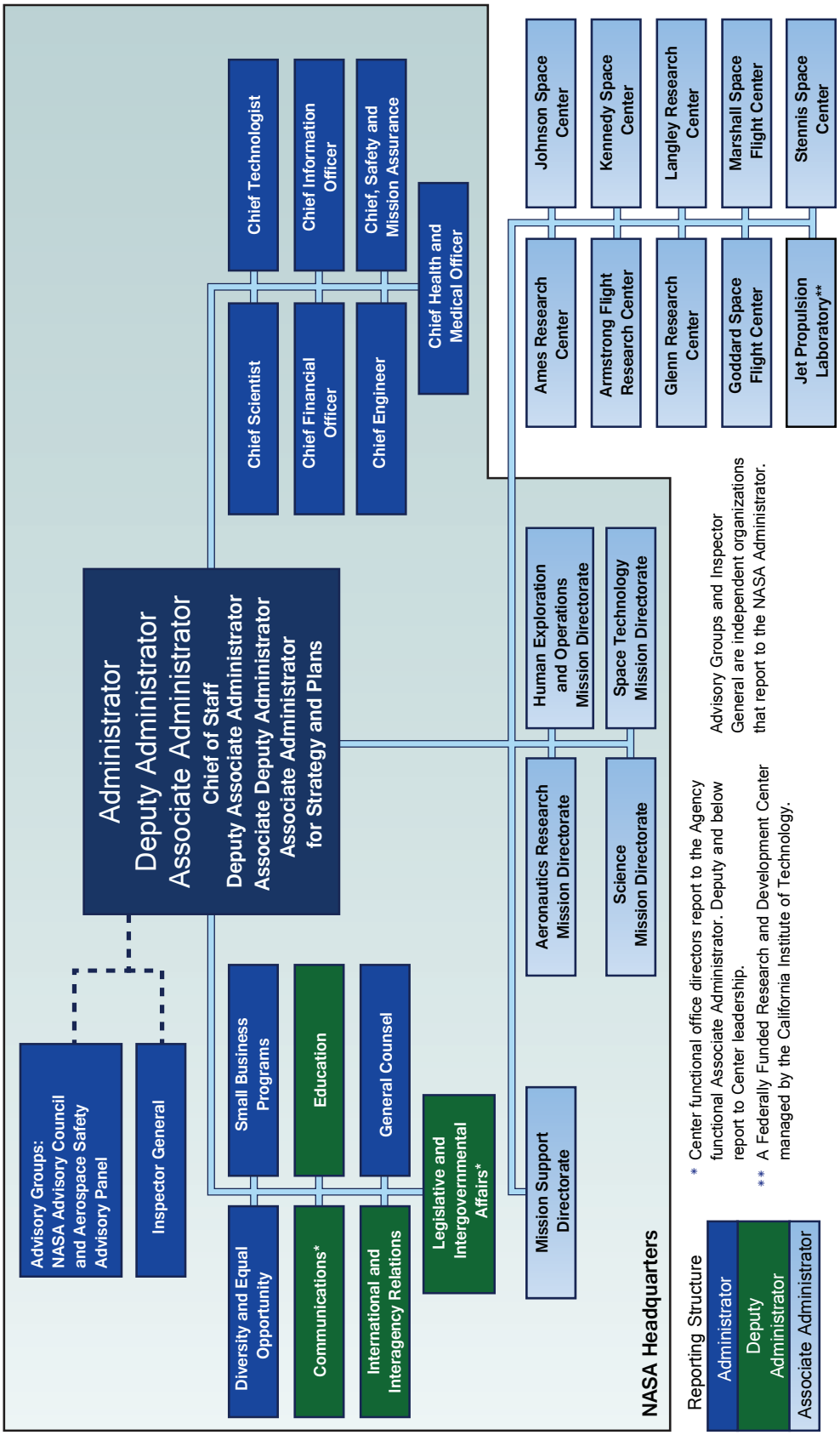
NASA's organizational structure is designed to accomplish its Mission and provide a framework for sound business operations, management controls, and safety oversight. The Office of the Administrator provides the overarching vision and strategic direction for the Agency. The Agency's science, research,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



- Administrator's Staff Offices
- Aeronautics Research Mission Directorate **(ARMD)**
- Office of Education **(Education)**
- Human Exploration and Operations Mission Directorate **(HEOMD)**
- Mission Support Directorate **(MSD)**
- Science Mission Directorate **(SMD)**
- Space Technology Mission Directorate **(STMD)**

More information about NASA organization is available at: http://www.nasa.gov/about/org_index.html.

Organizational Structure

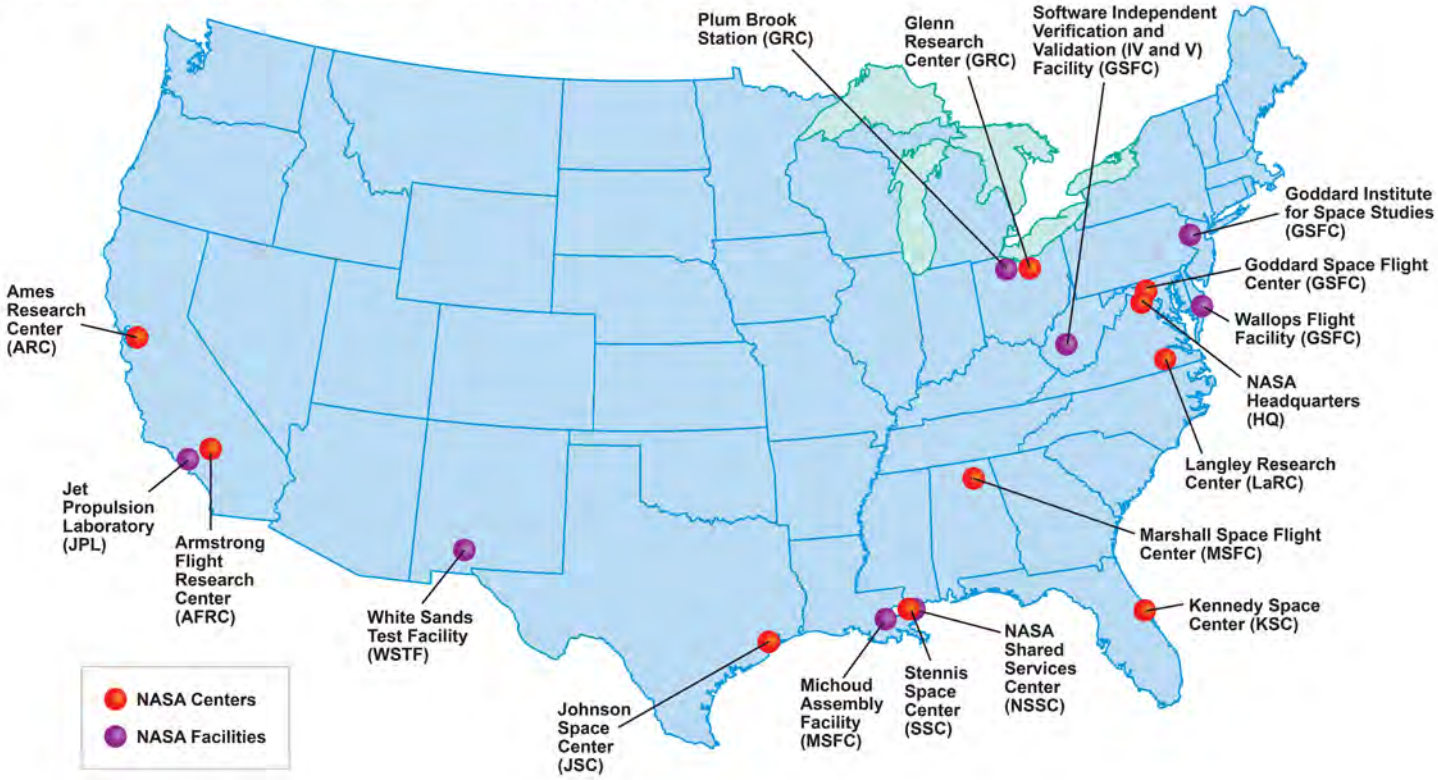


Centers and Facilities Nationwide

Under the leadership of the Administrator, NASA's Mission Directorates, MSD, and staff 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.

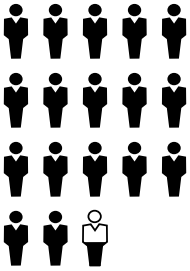
The NASA Shared Services Center (NSSC) was established in March 2006 to provide all NASA Centers timely, accurate, and cost-effective support services in the areas of financial management, human resources, information technology, procurement, and business support services.

NASA Centers and Facilities

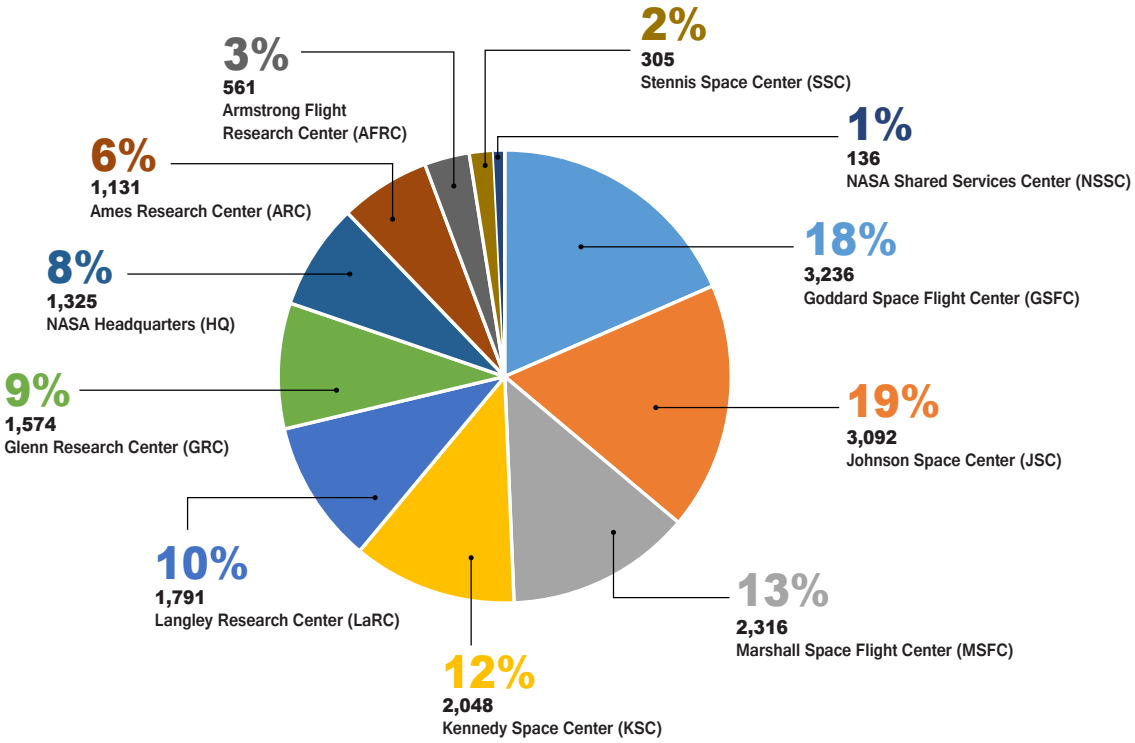


Note: JPL is a Federally Funded Research and Development Center in Pasadena, California. The California Institute of Technology manages JPL.

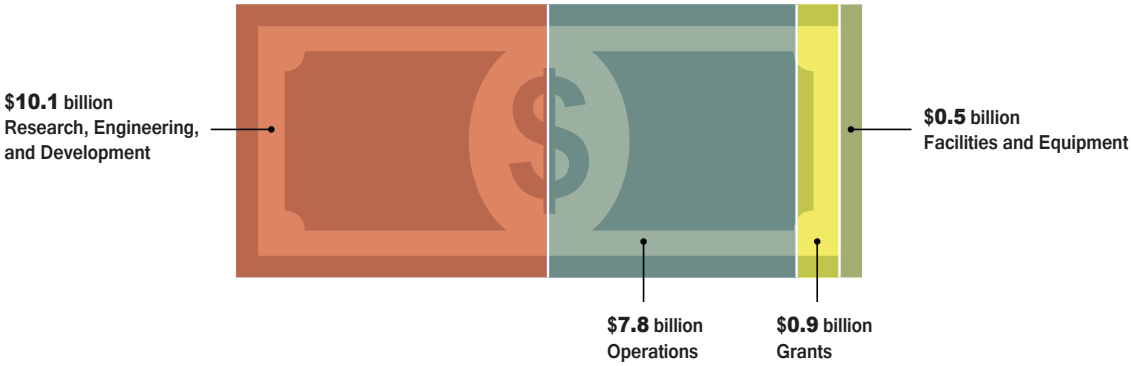
NASA by Numbers



= 1,000 Employees



$19.3 Billion Budget in FY 2016



More information about NASA's workforce is available at: https://wicn.nssc.nasa.gov/.

Mission Performance

SLS liquid hydrogen tank qualification test article, Michoud Assembly Facility, New Orleans, LA. **Photo credit:** NASA

Strategic Goal 1

Expand the frontiers of knowledge, capability, and opportunity in space.

By empowering the NASA community to...

- Objective 1.1: Expand human presence into the solar system and to the surface of Mars to advance exploration, science, innovation, benefits to humanity, and international collaboration.
- Objective 1.2: Conduct research on the International Space Station (ISS) to enable future space exploration, facilitate a commercial space economy, and advance the fundamental biological and physical sciences for the benefit of humanity.
- Objective 1.3: Facilitate and utilize U.S. commercial capabilities to deliver cargo and crew to space.
- Objective 1.4: Understand the Sun and its interactions with Earth and the solar system, including space weather.
- Objective 1.5: Ascertain the content, origin, and evolution of the solar system and the potential for life elsewhere.
- Objective 1.6: Discover how the universe works, explore how it began and evolved, and search for life on planets around other stars.
- Objective 1.7: Transform NASA missions and advance the Nation's capabilities by maturing crosscutting and innovative space technologies.

Strategic Goal 2

Advance understanding of Earth and develop technologies to improve the quality of life on our home planet.

By engaging our workforce and partners to...

- Objective 2.1: Enable a revolutionary transformation for safe and sustainable U.S. and global aviation by advancing aeronautics research.
- Objective 2.2: Advance knowledge of Earth as a system to meet the challenges of environmental change, and to improve life on our planet.
- Objective 2.3: Optimize Agency technology investments, foster open innovation, and facilitate technology infusion, ensuring the greatest national benefit.
- Objective 2.4: Advance the Nation's STEM education and workforce pipeline by working collaboratively with other agencies to engage students, teachers, and faculty in NASA's missions and unique assets.

Strategic Goal 3

Serve the American public and accomplish our Mission by effectively managing our people, technical capabilities, and infrastructure.

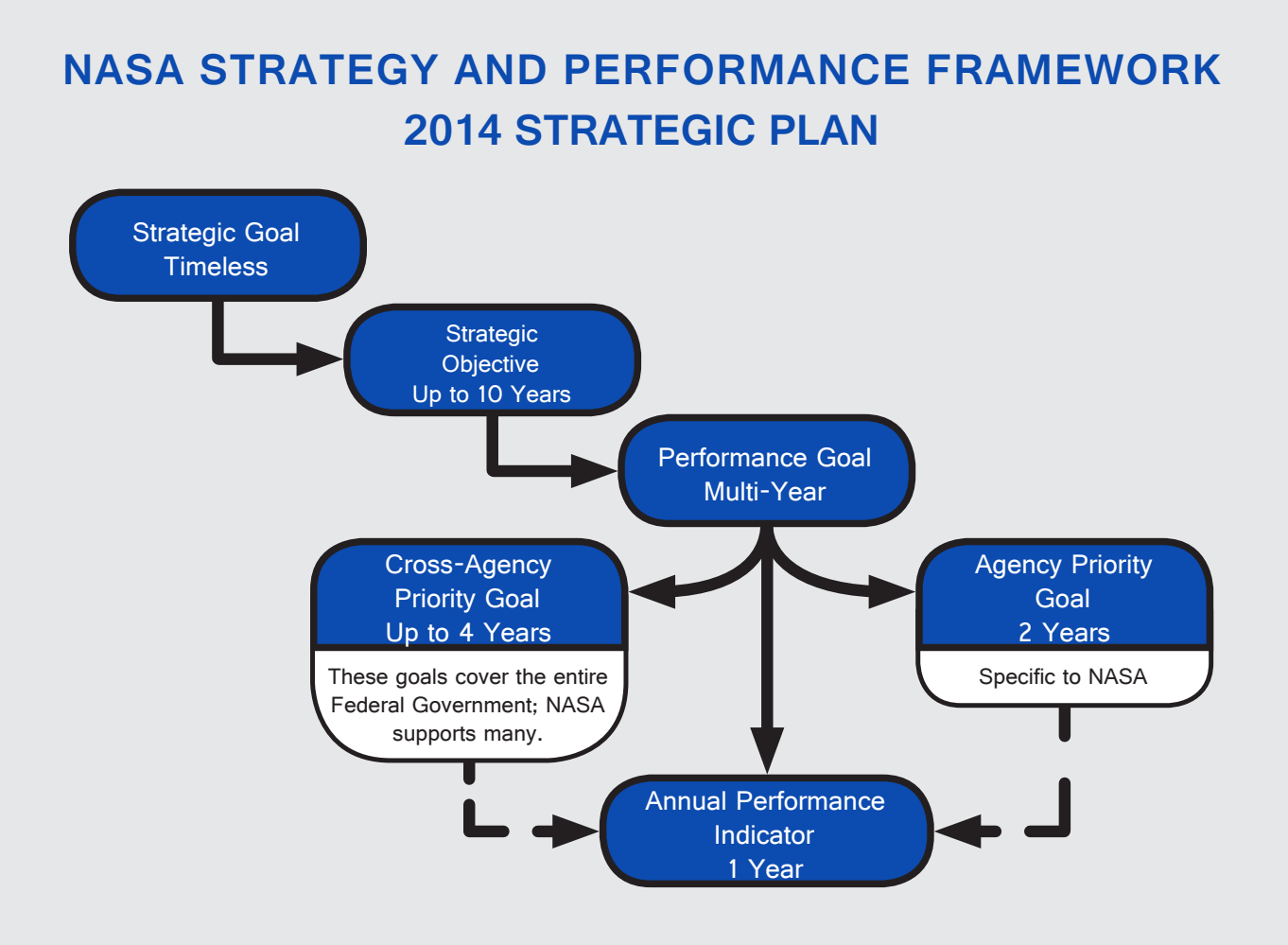
By working together to...

- Objective 3.1: Attract and advance a highly skilled, competent, and diverse workforce, cultivate an innovative work environment, and provide the facilities, tools, and services needed to conduct NASA's missions.
- Objective 3.2: Ensure the availability and continued advancement of strategic, technical, and programmatic capabilities to sustain NASA's Mission.
- Objective 3.3: Provide secure, effective, and affordable information technologies and services that enable NASA's Mission.
- Objective 3.4: Ensure effective management of NASA programs and operations to complete the mission safely and successfully.

Performance Overview

At the heart of NASA's strategic goals and strategic objectives are the core missions of human space exploration, Earth and space science, aeronautics, and technology development. NASA is building capabilities for human space exploration, commercial space transportation, and the use of the International Space Station (ISS) for research, while also developing the James Webb Space Telescope (Webb).

NASA sets near-term performance goals (PGs), which are targets for the next several years, as well as annual performance indicators (APIs) to measure and communicate progress towards achieving the Agency's Vision and Mission. These PGs and APIs are aligned to the strategic goals and objectives. Together, the strategic goals, strategic objectives, PGs, and APIs, along with cross-agency priority (CAP) goals and Agency priority goals (APGs), form NASA's strategy-performance framework. More information can be found in our 2014 Strategic Plan, at https://www.nasa.gov/news/budget/index.html, and at http://performance.gov.



In this FY 2016 Agency Financial Report, NASA presents a high-level summary of performance, reflecting preliminary year-end assessments of progress towards the performance goals (PGs) and annual performance indicators (APIs). Final ratings and more detailed information will be provided in the Annual Performance Report (APR) in 2017 at https://www.nasa.gov/news/budget/index.html.

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 and aeronautics technical evaluation bodies, validate select ratings prior to publication in the APR.

For reporting purposes, NASA uses a color-coded system to represent the assessment and rating of performance. Every performance metric has specific, individualized rating criteria. The generic rating criteria in the table below are illustrative of the types of individualized criteria assigned to each performance measure and broadly apply to the performance metrics.

Green	On Track or Complete	NASA completed or expects to complete this performance measure within the estimated timeframe.
Yellow	Slightly Below Target and/or Behind Schedule	NASA completed or expects to complete this performance measure, but is slightly below the target and/or moderately behind schedule.
Red	Significantly Below Target and/or Behind Schedule	NASA did not or does not expect to complete this performance measure within the estimated timeframe. The program is substantially below the target and/or significantly behind schedule.
White	Cancelled or Postponed	NASA senior management cancelled or postponed this performance measure. The Agency no longer is pursuing activities related to this performance measure or the program did not have activities during the fiscal year.

Note: These are generic criteria provided for informational purposes only. NASA develops measure-specific criteria to rate all of the Agency's performance goals and annual performance indicators.

In FY 2016, NASA reviewed progress towards 72 multi-year performance goals and 121 annual performance indicators – in total, progress against 193 performance metrics. NASA provided the FY 2016 Performance Plan online at http://www.nasa.gov/sites/default/files/atoms/files/fy14_apr-fy16_app.pdf in March 2015.

The summary of NASA's preliminary assessment of progress is provided below. The Agency will release final ratings with the APR in 2017.

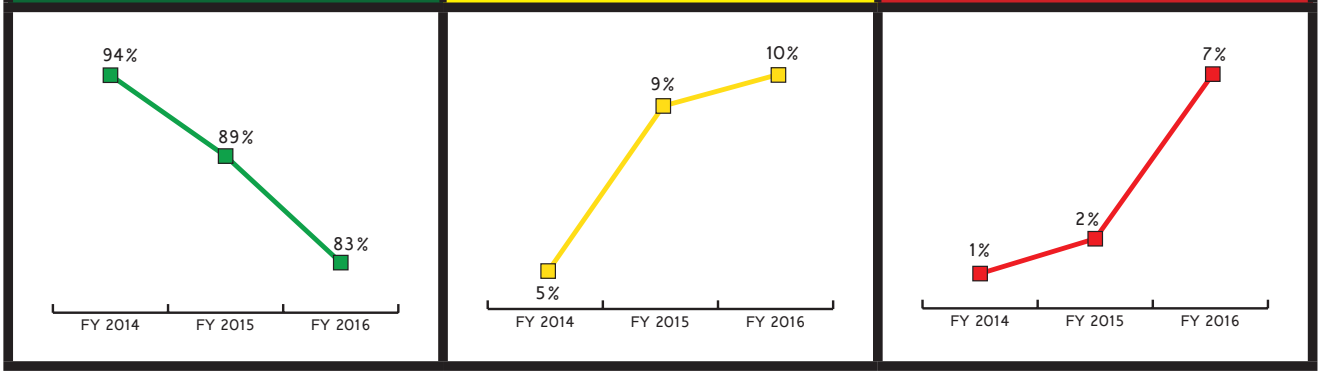
All Performance Metrics			
Number of Performance Metrics	193		
Green	Yellow	Red	Red/White*
83%	10%	6%	1%
160	19	13	1

Performance Metrics by Strategic Goal											
Strategic Goal 1				Strategic Goal 2			Strategic Goal 3		
82				50			61		
Green	Yellow	Red	Red/ White	Green	Yellow	Red	Green	Yellow	Red
83%	11%	5%	1%	84%	8%	8%	82%	10%	8%
68	9	4	1	42	4	4	50	6	5

Green	On Track or Complete
Yellow	Slightly Below Target and/ or Behind Schedule
Red	Significantly Below Target and/or Behind Schedule
White	Cancelled or Postponed

* NASA assigned a hybrid red/white rating to one of its annual performance indicators (APIs). Work on the API was not completed as planned due to both a budget reduction and internal programmatic decisions

Rating Trends for Total Metrics Over Previous Three Fiscal Years



Total Rating Counts by Fiscal Year

Year	Total Metrics	Green	Yellow	Red	Red/White
FY 2016	193	160	19	13	1
FY 2015	183	163	16	4	0
FY 2014	192	180	10	2	0

Total Rating Percentages by Strategic Goal

Strategic Goal	Year	Green	Yellow	Red	Red/White
1	FY 2016	↓ 83%	↓ 11%	↑ 5%	↑ 1%
	FY 2015	↓ 84%	↑ 15%	↑ 1%	↔ 0%
	FY 2014	99%	1%	0%	0%
2	FY 2016	↓ 84%	↑ 8%	↑ 8%	↔ 0%
	FY 2015	↑ 98%	↓ 2%	↔ 0%	↔ 0%
	FY 2014	96%	4%	0%	0%
3	FY 2016	↓ 82%	↑ 10%	↑ 8%	↔ 0%
	FY 2015	↑ 88%	↓ 7%	↑ 5%	↔ 0%
	FY 2014	85%	12%	3%	0%

Green — On Track or Complete

Yellow — Slightly Below Target and/or Behind Schedule

Red — Significantly Below Target and/or Behind Schedule

White — Cancelled or Postponed

* NASA assigned a hybrid red/white rating to one of its annual performance indicators (APIs). Work on the API was not completed as planned due to both a budget reduction and internal programmatic decisions

Strategic Goals and Highlights

OSIRIS-REx, NASA's first asteroid sampling mission, launches into space from Florida's Cape Canaveral Air Force Station aboard an Atlas V rocket on September 8, 2016. **Photo credit:** NASA

In this artist's concept, Juno eases into orbit around Jupiter, following its insertion burn. **Photo credit:** NASA

Juno Spacecraft in Orbit Around Jupiter

On July 4, 2016, after an almost five-year journey to the solar system's largest planet, NASA's Juno spacecraft successfully entered Jupiter's orbit following a 35-minute engine burn. Juno's principal goal is to understand the origin and evolution of Jupiter. With its suite of nine science instruments, Juno will investigate the existence of a solid planetary core, map Jupiter's intense magnetic field, measure the amount of water and ammonia in the deep atmosphere, and observe the planet's auroras. The mission also will let us take a giant step forward in our understanding of how giant planets form and the role these titans played in putting together the rest of the solar system. As our primary example of a giant planet, Jupiter also can provide critical knowledge for understanding the planetary systems being discovered around other stars.

Supported Goals and Objectives

Planetary Science supports Strategic Goal 1 and Strategic Objective 1.5

Expedition 46 Commander Scott Kelly of NASA rests in a chair outside of the Soyuz TMA-18M spacecraft just minutes after he and cosmonauts Mikhail Kornienko and Sergey Volkov of the Russian space agency Roscosmos landed in a remote area near the town of Zhezkazgan, Kazakhstan late Tuesday, March 2, 2016 EST. Kelly and Kornienko completed a record year-long International Space Station mission to collect valuable data on the effects of long-duration weightlessness on the human body that will be used to formulate a human mission to Mars. **Photo credit:** NASA

Scott Kelly Returns from One-Year ISS Mission

NASA astronaut and Expedition 46 Commander Scott Kelly and his Russian counterpart Mikhail Kornienko returned to Earth March 2, 2016, after a historic 340-day mission aboard the ISS. During the record-setting One-Year mission, the station crew conducted almost 400 investigations to advance NASA's mission and benefit all of humanity. Kelly and Kornienko specifically participated in a number of studies to inform NASA's Journey to Mars, including research into how the human body adjusts to weightlessness, isolation, radiation, and the stress of long-duration spaceflight. Kelly's identical twin brother, former NASA astronaut Mark Kelly, participated in parallel twin studies on Earth to help scientists compare the effects of space on the body and mind down to the cellular level.

Supported Goals and Objectives

ISS Operations support Strategic Goal 1 and Strategic Objective 1.2

The booster exhaust plume billows into the bright blue Utah sky behind the test stand. The shockwave from the motor firing kicks up small clouds of dust up and down the hillside. **Photo credit:** NASA

SLS Booster Qualification Motor Test a Success

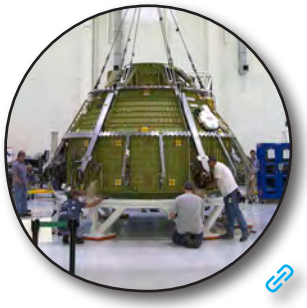
The second and final qualification motor (QM-2) test for SLS's booster took place Tuesday, June 28, 2016, at Orbital ATK Propulsion Systems test facilities in Promontory, Utah. When ignited, temperatures inside the booster reached nearly 6,000 degrees Fahrenheit. The two-minute, full-duration ground qualification test provided NASA with critical data on 82 qualification objectives that will support certification of the booster for flight. Engineers now will evaluate these data, captured by more than 530 instrumentation channels on the booster. During the SLS flight, the boosters will provide more than 75 percent of the thrust needed to escape the gravitational pull of the Earth, the first step on NASA's Journey to Mars.

Supported Goals and Objectives

SLS supports Strategic Goal 1 and Strategic Objective 1.1

@NASA SLS
#SLSFIREDUP

Strategic Goal 1 Highlights



Orion Pressure Vessel Passes Test

Supported Strategic Objective 1.1

Astronauts Enter ISS Inflatable Module for First Time

Supported Strategic Objective 1.2

Trailblazing Science and Cargo to ISS Aboard SpaceX Resupply Mission

Supported Strategic Objective 1.3

Magnetospheric Multiscale Observes Magnetic Reconnection

Supported Strategic Objective 1.4

Mars 2020 Rover Passes Major Development Milestone

Supported Strategic Objective 1.5

Four Months after Pluto Flyby, New Horizons Yields Wealth of Discovery

Supported Strategic Objective 1.5

James Webb Space Telescope Primary Mirror Fully Assembled

Supported Strategic Objective 1.6

Wide Field Infrared Survey Telescope Formally Begins

Supported Strategic Objective 1.6

Hubble Makes First Atmospheric Study of Earth-Sized Exoplanets

Supported Strategic Objective 1.6

Selection Made for Solar Electric Propulsion Development

Supported Strategic Objective 1.7

Strategic Goal 1 Ratings

Total Ratings for Strategic Goal 1	Green	Yellow	Red	Red/White*
Performance Goals	90%	7%	3%	---
	27	2	1	0
Annual Performance Indicators	79%	13%	6%	2%
	41	7	3	1

Green	On Track or Complete
Yellow	Slightly Below Target and/or Behind Schedule
Red	Significantly Below Target and/or Behind Schedule
White	Cancelled or Postponed
*	NASA assigned a hybrid red/white rating to one of its annual performance indicators (APIs). Work on the API was not completed as planned due to both a budget reduction and internal programmatic decisions

Ratings by Strategic Objectives 1.1 to 1.7	Performance Goals			Annual Performance Indicators			
	Green	Yellow	Red	Green	Yellow	Red	Red/White
	50%	50%	---	57%	29%	---	14%
1.1	2	2	0	4	2	0	1
	83%	---	17%	80%	---	20%	---
1.2	5	0	1	8	0	2	0
	100%	---	---	100%	---	---	---
1.3	2	0	0	2	0	0	0
	100%	---	---	86%	14%	---	---
1.4	4	0	0	6	1	0	0
	100%	---	---	92%	---	8%	---
1.5	6	0	0	11	0	1	0
	100%	---	---	71%	29%	---	---
1.6	5	0	0	5	2	0	0
	100%	---	---	71%	29%	---	---
1.7	3	0	0	5	2	0	0

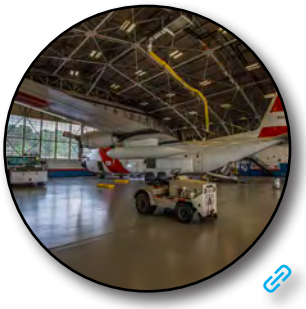
Strategic Goal 2 Highlights

NASA Begins Work to Build a Quieter Supersonic Passenger Jet

Supported Strategic Objective 2.1

New Airspace Technology Demonstration Lab Opens

Supported Strategic Objective 2.1



Study to Follow the Trail of Greenhouse Gases Through American Skies

Supported Strategic Objective 2.2

NASA Satellite Maps Show Human Fingerprint on Global Air Quality

Supported Strategic Objective 2.2

CORAL Campaign Will Raise Reef Studies to a New Level

Supported Strategic Objective 2.2

NASA Innovative Advanced Concepts Invests in 2D Spacecraft and Reprogrammable Microorganisms

Supported Strategic Objective 2.3

Dozens of Patents Available in Public Domain to Benefit U.S. Industry

Supported Strategic Objective 2.3

Experimental Program to Stimulate Competitive Research (EPSCoR) Grant Awards Made

Supported Strategic Objective 2.4

Strategic Goal 2 Ratings

Total Ratings for Strategic Goal 2	Green	Yellow	Red
Performance Goals	84%	5%	11%
	16	1	2
Annual Performance Indicators	84%	10%	6%
	26	3	2

Green	On Track or Complete
Yellow	Slightly Below Target and/or Behind Schedule
Red	Significantly Below Target and/or Behind Schedule
White	Cancelled or Postponed

Ratings by Strategic Objectives 2.1 to 2.4	Performance Goals			Annual Performance Indicators		
	Green	Yellow	Red	Green	Yellow	Red
	100%	---	---	77%	23%	---
2.1	6	0	0	7	2	0
	88%	12%	---	94%	6%	---
2.2	7	1	0	15	1	0
	100%	---	---	100%	---	---
2.3	1	0	0	2	0	0
	50%	---	50%	50%	---	50%
2.4	2	0	2	2	0	2

Strategic Goal 3 Highlights

Computational Facility Named After Langley "Human Computer" Katherine Johnson

Supported Strategic Objective 3.1

Crews 'Top Out' First of Two New SLS Test Stands at MSFC

Supported Strategic Objective 3.1

RP-25 Engine Tests for SLS March On

Supported Strategic Objective 3.2

NASA's OSIRIS-REx Speeds Toward Asteroid Rendezvous

Supported Strategic Objective 3.2

SCaNiversary: Ten Years of Space Communications and Navigation Program Office

Supported Strategic Objective 3.2

Meet NASA Datanauts: 2016 Class

Supported Strategic Objective 3.3

Updates to Policy on Mishap and Close Call Reporting, Investigating and Recordkeeping Improve Investigation Process

Supported Strategic Objective 3.4

2016's First Issue of Orbital Debris Quarterly News Now Available

Supported Strategic Objective 3.4

Strategic Goal 3 Ratings

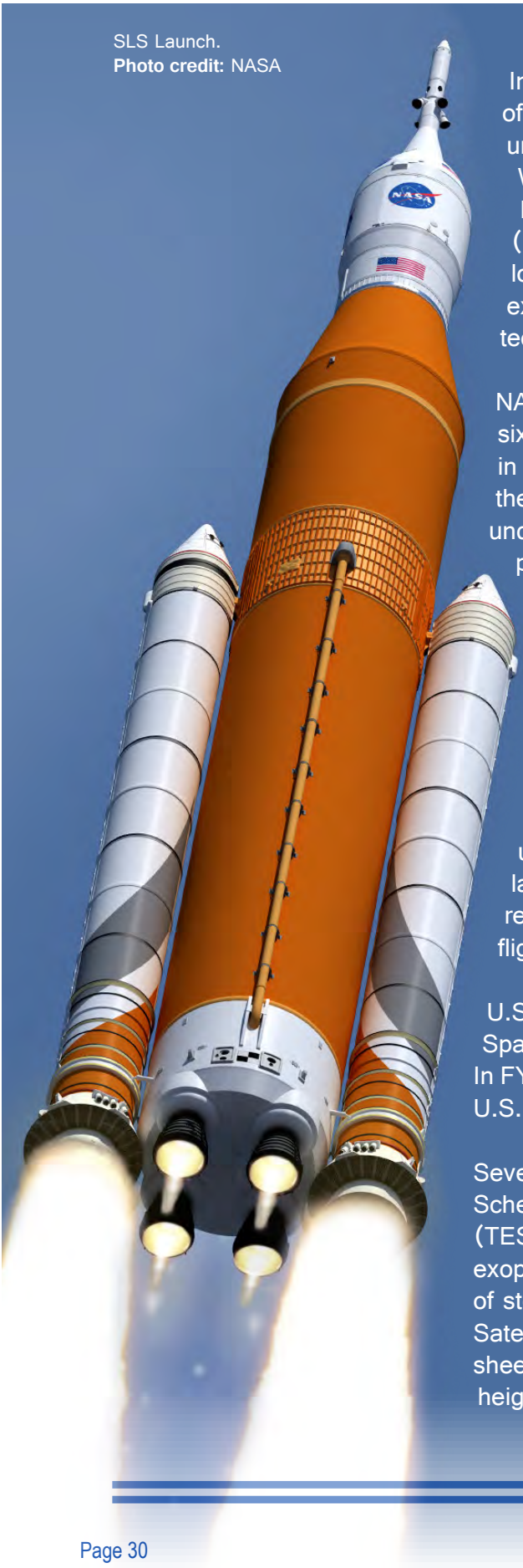
Total Ratings for Strategic Goal 3	Green	Yellow	Red
Performance Goals	78%	13%	9%
	18	3	2
Annual Performance Indicators	84%	8%	8%
	32	3	3

Green	On Track or Complete
Yellow	Slightly Below Target and/or Behind Schedule
Red	Significantly Below Target and/or Behind Schedule
White	Cancelled or Postponed

Ratings by Strategic Objectives 3.1 to 3.4	Performance Goals			Annual Performance Indicators		
	Green	Yellow	Red	Green	Yellow	Red
3.1	70%	20%	10%	76%	18%	6%
	7	2	1	13	3	1
3.2	100%	---	---	100%	---	---
	6	0	0	7	0	0
3.3	60%	20%	20%	78%	---	22%
	3	1	1	7	0	2
3.4	100%	---	---	100%	---	---
	2	0	0	5	0	0

Looking Forward

Orion upper stage orbital insertion. Artist's concept. **Photo credit:** NASA



SLS Launch.
Photo credit: NASA

In the coming years, NASA's work on expanding the frontiers of knowledge, capability, and opportunity in space; advancing understanding of Earth; and serving the American public continues. We are making the first steps towards a crewed mission to Mars. The research done aboard the International Space Station (ISS) feeds directly into the knowledge base required for any long-duration crewed mission. The next generation deep space exploration systems embodied in SLS and Orion, coupled with new technologies in development, are key elements towards this goal.

NASA and its ISS partners announced the crew selections for six expeditions running through early 2018. These crews engage in a robust regimen of research projects aimed at understanding the long-term impacts on human physiology and expanding our understanding of the impacts of microgravity on life sciences and physical sciences. The ISS also serves as a platform for on-board instrumentation projects. An example of one such project is the upcoming Neutron star Interior Composition Explorer (NICER) mission studying neutron stars from an ISS-mounted external payload.

The final integration and testing of the Orion command module slated to fly on the EM-1 mission takes place over the next year, as well as the European Service Module's arrival. The 2018 uncrewed EM-1 flight will be Orion's second flight and SLS's first, launching Orion into a retrograde orbit around the Moon before returning to Earth. Further plans include a crewed Orion-SLS EM-2 flight and potential science missions for SLS.

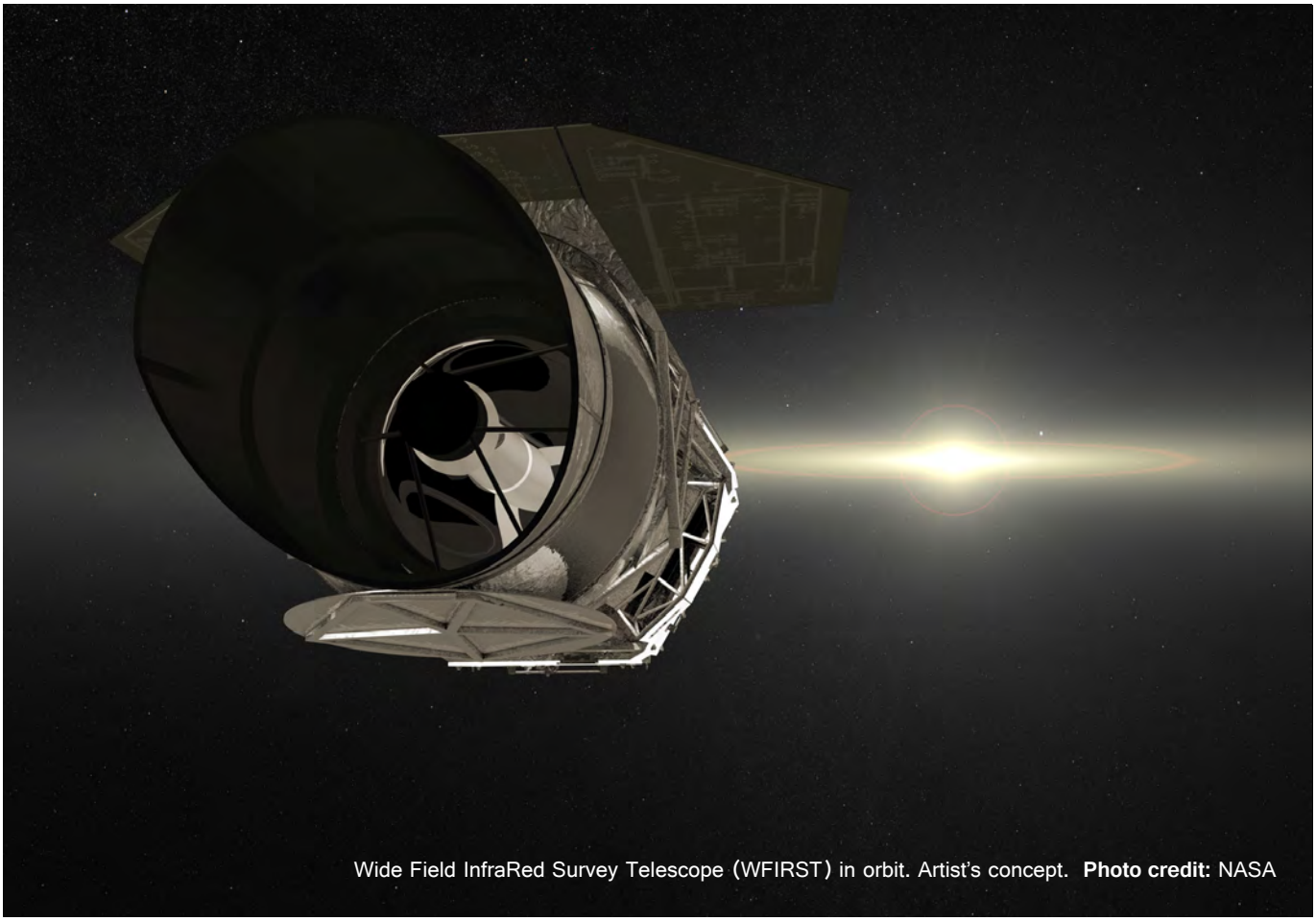
U.S. commercial operations to the ISS continue to make strides. SpaceX and Orbital-ATK regularly launch ISS cargo resupply flights. In FY 2017, we are making key steps towards developing and certifying U.S. industry-based crew transportation systems to the ISS.

Several major Science missions will launch in the coming years. Scheduled for launch in 2017, the Transiting Exoplanet Survey Satellite (TESS), the first-ever spaceborne all-sky transit survey, will identify exoplanets ranging from Earth-sized to gas giants orbiting a wide range of stellar types and orbital distances. Ice, Cloud, and Land Elevation Satellite-2 (ICESat-2) will continue the important observations of ice-sheet elevation change, sea-ice freeboard, and vegetation canopy height begun by ICESat in 2003.

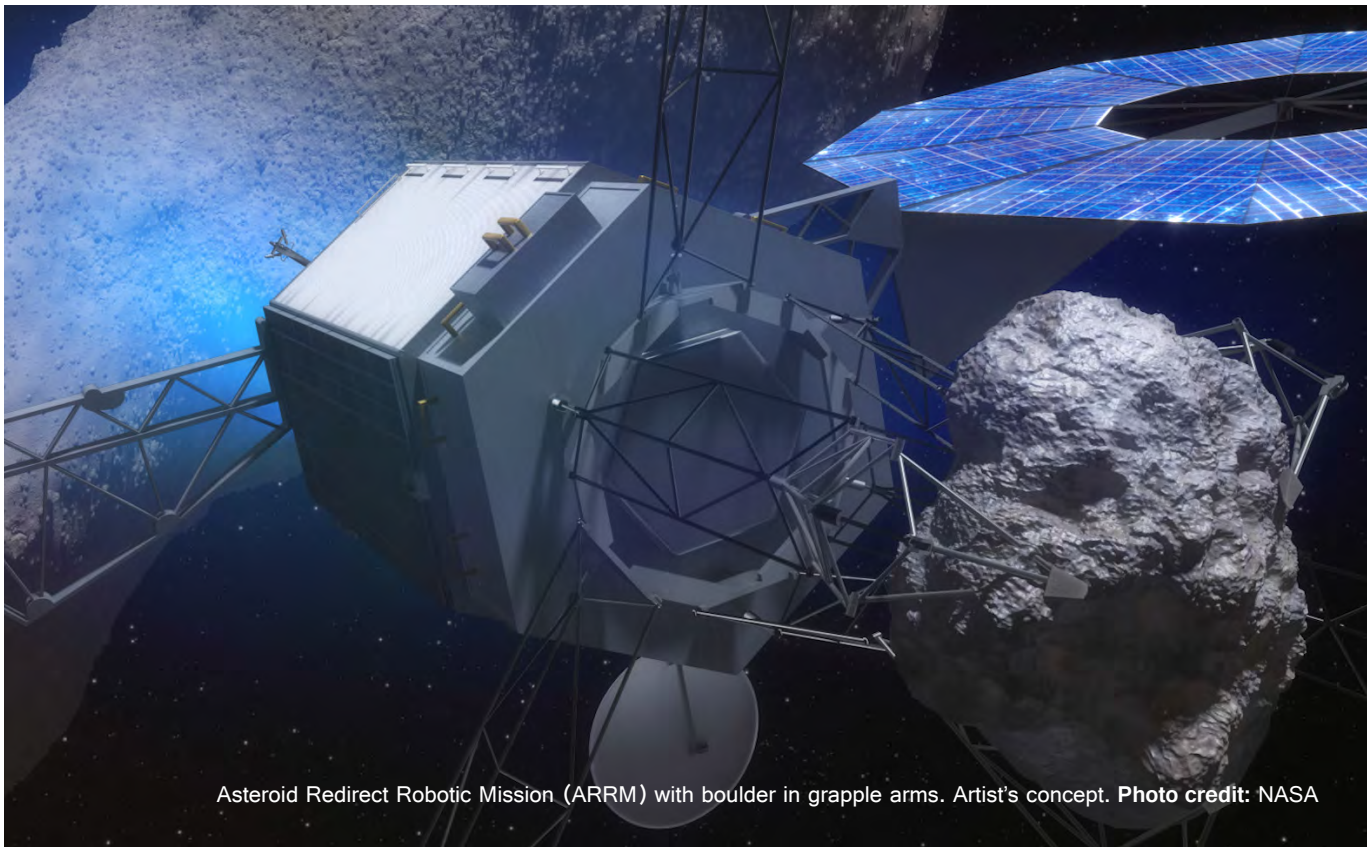
The James Webb Space Telescope, with a planned launch in 2018, will be the premier observatory of the next decade serving thousands of astronomers worldwide. NASA's participation in the 2018 European Space Agency's ExoMars Rover mission includes providing critical elements to the premier astrobiology instrument on the rover, the Mars Organic Molecule Analyzer (MOMA).

Other missions launching in the immediate future include Solar Probe Plus (SPP), Solar Orbiter Collaboration (SOC), Ionospheric Connection Explorer (ICON), Global-scale Observations of the Limb and Disk (GOLD), and Gravity Recovery and Climate Experiment Follow-on (GRACE-FO).

NASA continues development of other key science missions with more distant planned launch dates. The Mars 2020 mission addresses high-priority science goals for Mars exploration, including key questions about the potential for life on Mars. The mission takes the next step by not only seeking signs of habitable conditions on Mars in the ancient past, but also searching for signs of past microbial life itself. The Mars 2020 rover introduces a drill that can collect core samples of the most promising rocks and soil and cache these samples on the surface of Mars for future retrieval. The Wide Field InfraRed Survey Telescope (WFIRST) is a NASA observatory in formulation that could address essential questions in the areas of dark energy, exoplanets, and infrared astrophysics. Planning is under way for a mission that will place a spacecraft in orbit around Jupiter, to perform repeated close flybys of Jupiter's moon Europa.



Wide Field InfraRed Survey Telescope (WFIRST) in orbit. Artist's concept. **Photo credit:** NASA



Asteroid Redirect Robotic Mission (ARRM) with boulder in grapple arms. Artist's concept. **Photo credit:** NASA

The Nation's investments in space technology enable NASA to make a difference in the world around us. NASA is responsible for developing the pioneering new technologies and capabilities needed to achieve our current and future missions.

NASA's Solar Electric Propulsion (SEP) project is developing critical technologies to extend the length and capabilities of ambitious new science and exploration missions. Restore-L will continue formulation activities to support a technology demonstration mission capable of servicing a U.S. Government satellite in low Earth orbit. The Mars Oxygen ISRU Experiment (MOXIE) will be the first in-situ resource utilization (ISRU) technology demonstration on Mars, flying with the Mars 2020 mission in 2020.

Aeronautics research is a key focus for NASA efforts. NASA is working to create new experimental aircraft that will demonstrate new green aviation technology intended to dramatically reduce fuel use, emissions, and noise with the goal of cutting emissions from the nation's commercial aircraft fleet by more than 50 percent, while also reducing perceived noise levels near airports to one-half the level of the quietest aircraft flying today. This return to flying large-scale X-plane technology demonstrators is part of New Aviation Horizons, an ambitious 10-year accelerated research plan developed and announced by NASA earlier this year.

NASA will continue to focus on fiscal responsibility, performance management, and long-term affordability, while also addressing management challenges and risks that may pose roadblocks to our Nation's leadership and future successes in space exploration. These projects, and the others not mentioned here, are the tools that will help piece together the puzzle that is our planet, our solar system, and our universe.

Financial Performance

Financial Highlights

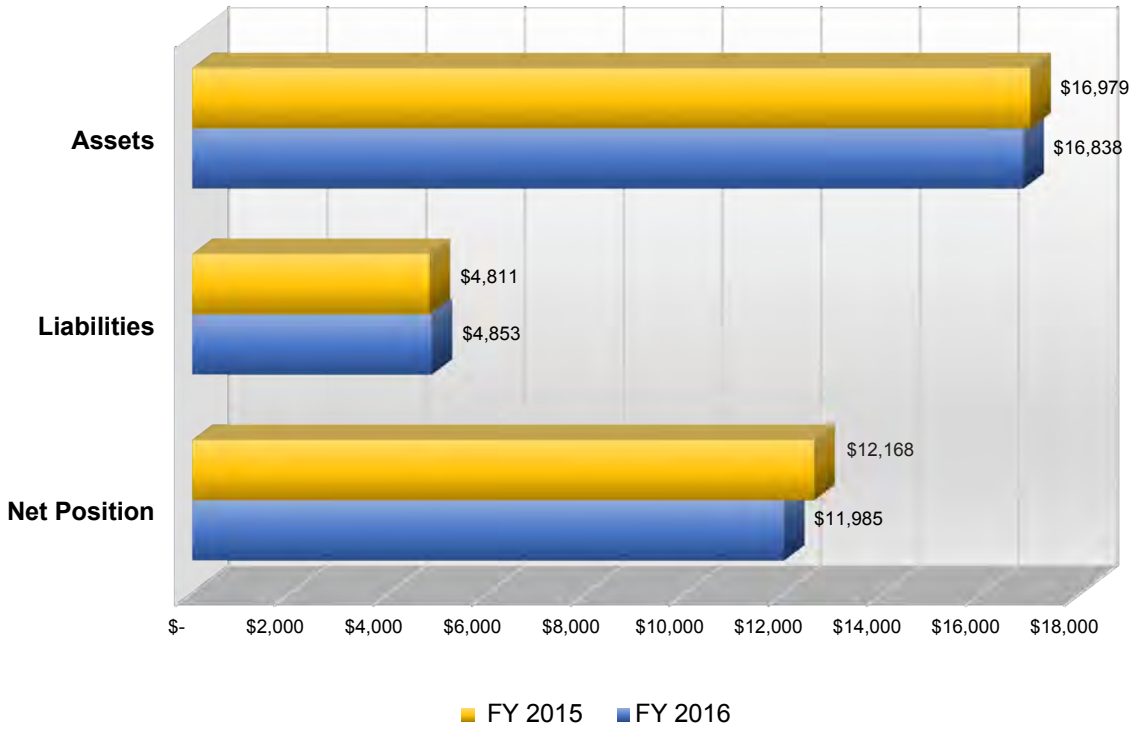
Overview of Financial Position

NASA's Balance Sheet provides a comparable snapshot of the Agency's financial position as of September 30, 2016, and September 30, 2015. It displays amounts in three primary categories.

- **Assets, which are the current and future economic benefits owned or available for use by NASA.**
- **Liabilities, which are amounts owed by NASA but not yet paid.**
- **Net Position, which reflects the sources and uses of Agency funding.**

Comparative Balance Sheet FY 2015 - 2016

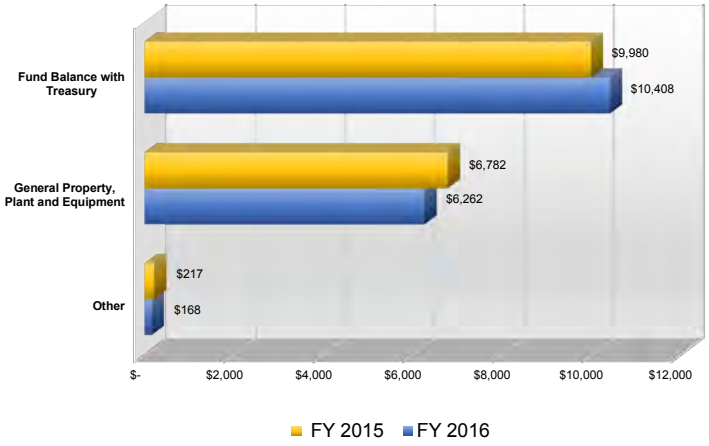
(in Millions of Dollars)



Total Assets were the largest of the three categories (Total Liabilities plus Total Net Position will always equal Total Assets). NASA's asset balance at the end of September 30, 2016, was $16.8 billion, 1 percent lower than in FY 2015.

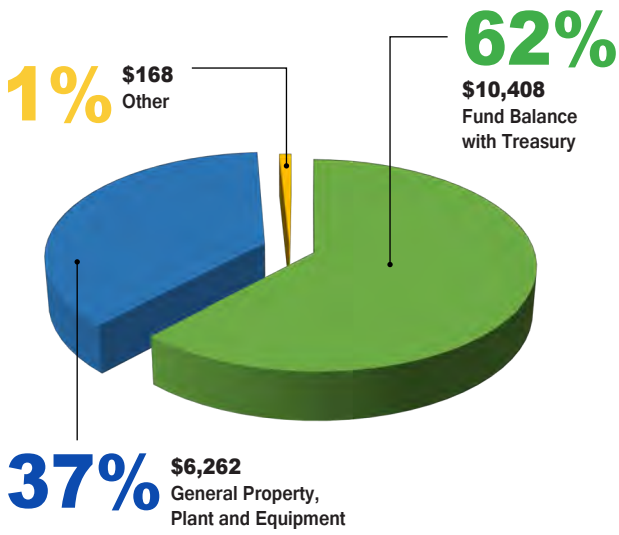
Assets by Type Comparisons FY 2015 and 2016

(in Millions of Dollars)



Assets by Type for FY 2016

(in Millions of Dollars)



The Agency's Fund Balance with Treasury (FBWT) and its General Property, Plant and Equipment (G-PP&E) were the two primary components of the total asset balance.

FBWT, which represents NASA's cash balance with the U.S. Department of the Treasury, was the largest asset at $10.4 billion, 62 percent of total assets. This cash balance included Congressional appropriated funds available for NASA's mission work (for example, employee labor or purchased goods or services from contractors) that have not yet been paid.

NASA's G-PP&E had a net book value of $6.3 billion as of September 30, 2016, which was a decrease of $520 million, 8 percent lower than in FY 2015. The decrease was driven by continued depreciation of the International Space Station (ISS) through March 31, 2016.

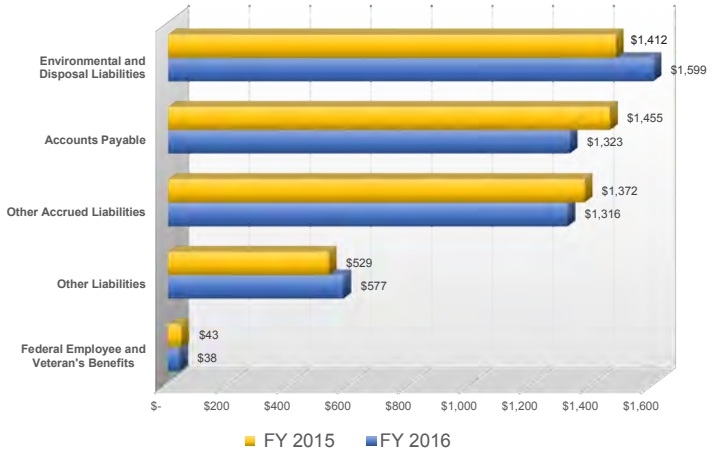
The Other category represents the amount of Investments, Accounts Receivable, and Other Assets as of September 30, 2016. The decrease of $49 million, 23 percent lower than FY 2015, is primarily due to less activity provided to the National Oceanic and Atmospheric Administration (NOAA), Geostationary Operational Environmental Satellite (GOES-R) program.

Total Liabilities as of September 30, 2016, were $4.9 billion, 1 percent higher than in FY 2015. Environmental and Disposal Liabilities, Accounts Payable, and Other Accrued Liabilities represent the majority of NASA's liabilities.

Environmental and Disposal Liabilities of $1.6 billion, represents the estimated cost to cleanup both known and projected environmental hazards. These liabilities increased by $187 million, or 13 percent, from FY 2015. The increase was primarily due to a new methodology for estimating the asbestos cleanup liability by using existing asbestos survey data across the Agency and industry standard asbestos removal cost fac-

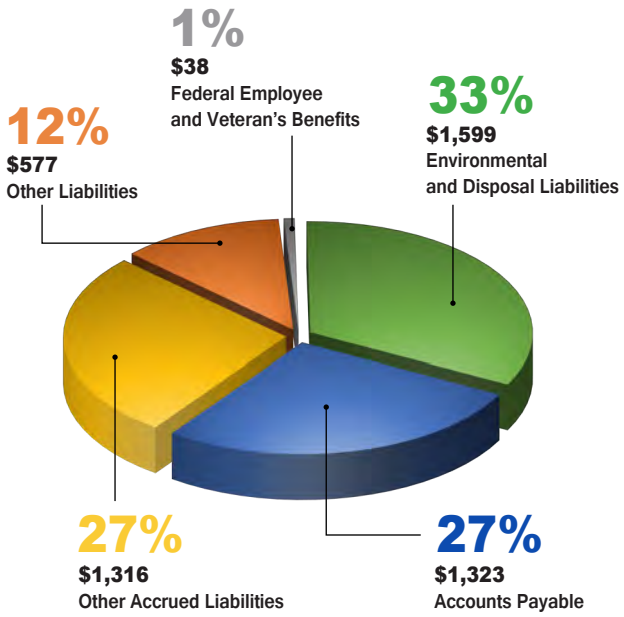
Liabilities by Type Comparison FY 2015 and 2016

(in Millions of Dollars)



Liabilities by Type for FY 2016

(in Millions of Dollars)



tor estimates. Additionally, the change is due to availability of new and/or updated information on the extent of contamination at restoration project sites at Santa Susanna Field Laboratory.

Accounts Payable, which represents amounts owed to other entities, was $1.3 billion, a decrease of $132 million, or 9 percent, compared to FY 2015.

Other Accrued Liabilities with public entities were $1.3 billion, a decrease of $56 million, or 4 percent, compared to FY 2015.

Other Liabilities, which represents various amounts, including Advances to Others, Unfunded Annual Leave and Accrued Funded Payroll, increased by $48 million, 9 percent higher than in FY 2015.

Federal Employee and Veteran's Benefits are amounts the Department of Labor estimates on behalf of NASA for future workers' compensation liabilities for current employees. The estimate for future workers' 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.

Total Net Position comprised of Unexpended Appropriations and Cumulative Results of Operations ("net worth"), decreased by $183 million, 2 percent lower than FY 2015. Unexpended Appropriations, at $7.5 billion, was up by 8 percent from FY 2015 balances. Cumulative Results of Operations, at $4.5 billion, was down by 14 percent from FY 2015 balances, primarily due to the decrease in ISS depreciation expense, as most of its components were fully depreciated as of March 31, 2016.

Sources of Funding

The Statement of Budgetary Resources provides information on the budgetary/funding available to NASA. NASA's resources consist primarily of funds received from two sources:

- Appropriations from Congress for the current fiscal year and unobligated balances from prior fiscal years.
- Revenue from agreements with other governmental organizations or private entities

In FY 2016, the total funds available for use by the Agency were $23.6 billion.

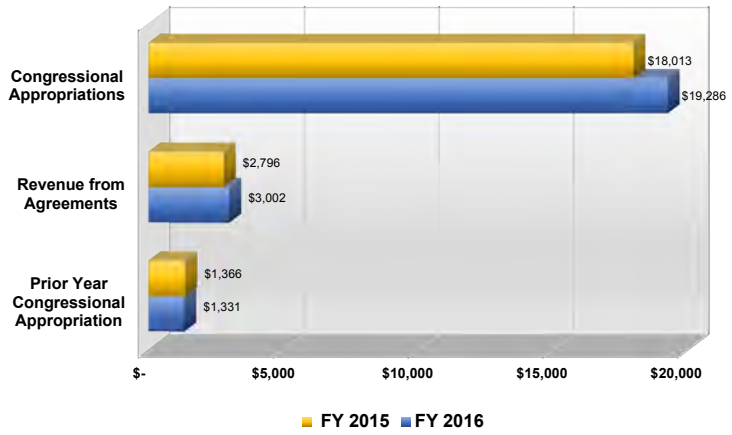
Appropriations from Congress for FY 2016, at $19.3 billion, comprised 82 percent of the funds available for use by the Agency. Congress designates the funding available to the Agency for a specific NASA mission or purpose. Appropriations that remained available from prior years comprised $1.3 billion, 5 percent of NASA's available resources in FY 2016.

NASA's FY 2016 funding also included $3.2 billion, comprised of revenue earned from agreements of $3.0 billion and recoveries of prior year obligations of $243 million. Earned revenues with other governmental organizations or private entities were received under NASA's authority to provide goods, services, or use of facilities to other entities on a reimbursable basis.

Of the $23.6 billion funding available to NASA in FY 2016, NASA obligated $22.5 billion for programmatic and institutional use. An obligation results from an agreement that binds the Government to make an expenditure (or outlay) of funds, and reflects a reservation of budget authority that will be used to pay for a contract, labor, or other items. The remaining $1.1 billion remains available for obligation until the funds are no longer available for NASA missions.

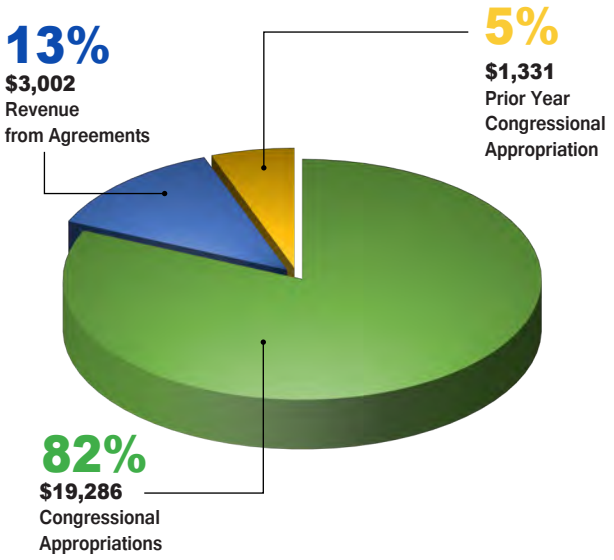
Sources of Funding Comparison FY 2015 and 2016

(in Millions of Dollars)



Sources of Funding for FY 2016

(in Millions of Dollars)



Aboard the International Space Station, NASA astronaut Kate Rubins checks a sample for air bubbles prior to loading it in the biomolecule sequencer. **Photo credit:** NASA

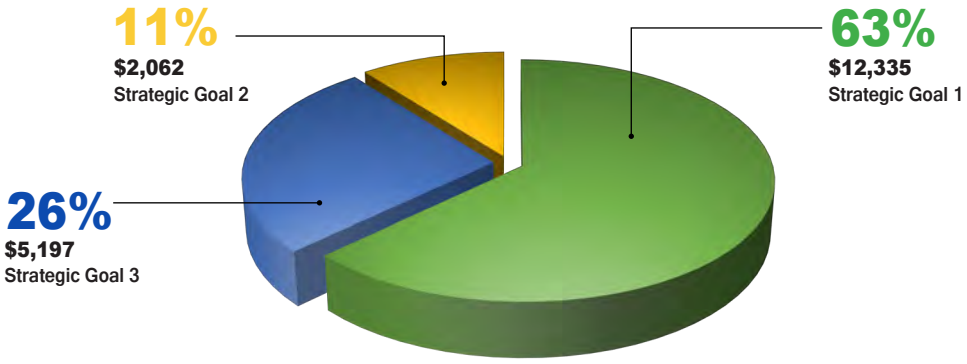
Results of Operations

Net Cost of Operations

The Statement of Net Cost presents NASA's net cost of operations by strategic goal. NASA's strategic goals are described in the Mission Performance section of the Agency Financial Report. The Net Cost of Operations represents gross cost incurred less revenue earned for work performed for other Government organizations or private entities. As of September 30, 2016, NASA's gross costs were $21.8 billion, a decrease of $50 million from FY 2015. Earned Revenue from other governmental organizations or private entities was $2.2 billion, 10 percent of gross costs, leaving NASA with a FY 2016 net cost of $19.6 billion, an increase of $24 million from FY 2015.

Net Cost of Operations by Strategic Goal

(in Millions of Dollars)



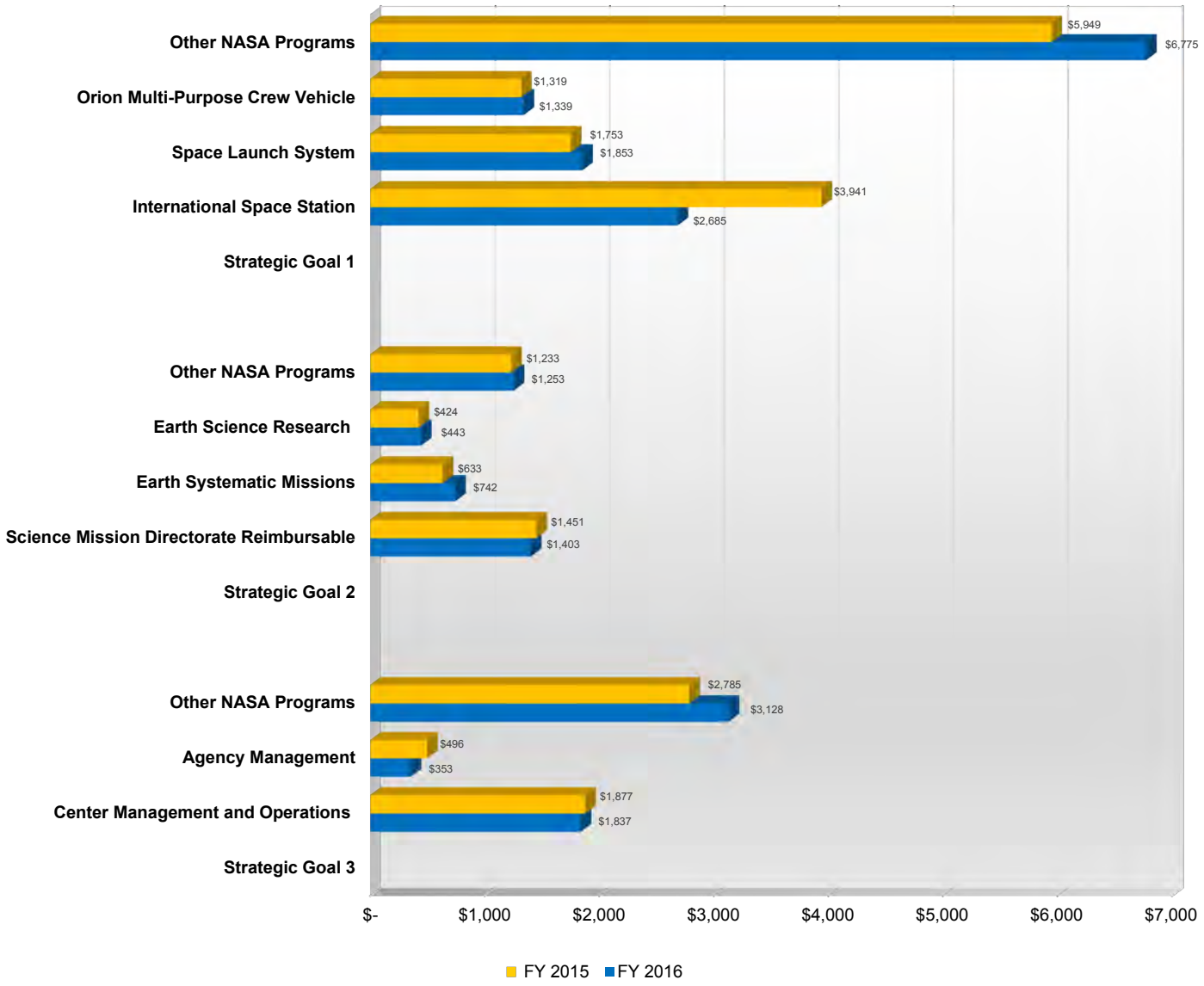
Gross Costs of Operations

NASA's day-to-day operations are performed at NASA and contractor offices and facilities around the globe and in space.

Gross costs of operations is presented in the following table, detailing select NASA programs that supported each strategic goal. Gross costs of operations include expenses incurred for NASA's research and development (R&D) investments that are expected to maintain or increase national economic productive capacity or yield other future benefits. See the Required Supplementary Stewardship Information section (page 76) of this report for further discussion. Highlights of NASA program activities as of September 30, 2016, that contributed to gross costs are provided for each strategic goal. A discussion of activities and costs that were reimbursed primarily by other Government organizations or private entities (for example, earned revenue) is also provided.

Comparative Gross Costs of Operations by Strategic Goal FY 2015 - 2016

(in Millions of Dollars)



Strategic Goal 1:

Expand the frontiers of knowledge, capability, and opportunity in Space.

Gross Costs for Strategic Goal 1 were $12.7 billion, a decrease of $310 million, or 2 percent from FY 2015 costs. The costs for this strategic goal represent 58 percent of total Agency gross cost. The three primary programs that support this goal were International Space Station (ISS), Space Launch System (SLS), and Orion, which contributed close to 50 percent of the cost of Strategic Goal 1:

- The ISS program had costs of $2.7 billion, $1.3 billion lower compared to FY 2015. In FY 2016, NASA transferred the Commercial Crew and Cargo out of ISS and created a new program. In addition, most ISS components were fully depreciated in March 2016, which resulted in significant cost decreases.

- The SLS program had costs of $1.8 billion, $100 million higher costs compared to FY 2015. The Orion program incurred costs of $1.3 billion, $20 million higher costs compared to FY 2015. The SLS and Orion programs experienced a combined increase in gross costs of $120 million between FY 2015 and FY 2016, primarily due to increased activity as the programs approach their first integrated flight test (Exploration Mission-1) scheduled for FY 2018. Additionally, funds were expended for Exploration Upper Stage development that was initiated in FY 2016 as enacted by Congress.

- Other NASA programs that contribute to Strategic Goal 1 include major flight development projects such as Commercial Crew, James Webb Space Telescope, and Mars 2020, in addition to technology development programs such as Solar Electric Propulsion.

Strategic Goal 2:

Advance understanding of Earth and develop technologies to improve the quality of life on our home planet.

Gross Costs for Strategic Goal 2 were $3.8 billion, an increase of $100 million, or 3 percent over FY 2015 costs. The costs for this strategic goal represent 18 percent of total Agency gross cost. Almost half of the costs incurred for Strategic Goal 2 were in support of activities performed for other Government organizations or private entities who reimburse NASA for these costs (earned revenue). The primary reimbursable activities are described in the earned revenue discussion below.

The largest NASA organization and programs supporting Strategic Goal 2 were the Science Mission Directorate Reimbursable funding portfolio, Earth Systematic Mission, and Earth Science Research.

- The Science Mission Directorate reimbursable funding portfolio incurred costs of $1.4 billion, $48 million lower compared to FY 2015. The decrease is primarily attributable to the launch of NOAA's Deep Space Climate Observatory (DSCOVR) mission in February 2016, and corresponding decrease in development activity.

- The Earth Systematic Mission program incurred costs of $742 million, $109 million higher compared to FY 2015. The program experienced an increase in gross costs between FY 2015 and FY 2016, primarily due to a number of flight projects (NASA-ISRO Synthetic Aperture Radar (NISAR), Landsat 9, Surface Water Ocean Topography (SWOT), Radiation Budget Instrument (RBI), and ICESat-2) increasing in activity as they approached the peak of their development effort.

- The Earth Science Research program incurred costs of $443 million, $19 million higher compared to FY 2015. In FY 2016, NASA chose to split the Science Directed Research and Technology (R&T) budget between four different programs, rather than consolidate the budget in the Heliophysics R&T program similarly to FY 2015. The inclusion of Directed R&T is the primary driver of the increase in this program.

- Other NASA programs that contribute to Strategic Goal 2 include various Earth Science and Aeronautics research projects.

Strategic Goal 3:

Serve the American public and accomplish our Mission by effectively managing our people, technical capabilities, and infrastructure.

Gross Costs for Strategic Goal 3 were $5.3 billion, an increase of $160 million, 3 percent over FY 2015 costs. The costs for this strategic goal represent 24 percent of total Agency gross cost. Two of the largest NASA programs supporting Strategic Goal 3 were Center Management and Operations (CMO) and Agency Management and Operations (AMO).

- CMO had costs of $1.8 billion, $40 million lower compared to FY 2015. The costs were driven by a consolidation of network operations and voice services under the Agency Chief Information Officer (CIO). Existing funds supporting these activities were reallocated from CMO to Agency Information Technology (IT) Services. Centralized funding and management improved IT security and supports compliance with the Federal Information Technology Acquisition Reform Act.

- AMO had costs of $353 million, $13 million higher compared to FY 2015. Significant driver for the cost increase were civil service labor costs. Labor increases stemmed from cost of living pay raises, higher health benefit premiums, increased Federal Employees Retirement System (FERS) retirement costs, and salary growth.

- Other NASA programs that contribute to Strategic Goal 3 include various mission support and safety functions, such as the Space Communications and Navigation program, the Launch Services program, and Construction of Facilities projects.

Earned Revenue

Total earned revenue, which represents work performed by NASA for other governmental organizations or private entities, was $2.2 billion in FY 2016, a decrease of $74 million from FY 2015. Two programs accounted for over half of NASA's earned revenue in FY 2016: Joint Polar Satellite System (JPSS) and Geostationary Operational Environmental Satellites – R Series (GOES-R).

- NASA supports JPSS in partnership with the National Oceanic and Atmospheric Administration (NOAA). JPSS had earned revenue of $677 million, a decrease of $129 million from 2015, primarily due to completion of the final instrument integrated with NOAA's JPSS-1 spacecraft.

- Earned Revenue from GOES-R was $603 million, a decrease of less than $1 million from 2015, primarily due to completion of the development of the GOES-R series satellite, which is scheduled for launch in November 2016.

Limitations of the Financial Statements

The principal financial 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 GAAP for Federal entities and the formats prescribed by OMB, the statements are in addition to the financial reports used to monitor and control budgetary resources, which are prepared from the same books and records. The statements should be read with the realization that they are for a component of the U.S. Government, a sovereign entity.

Expedition 48 crew members Kate Rubins (left) and Jeff Williams (right) of NASA outfit spacesuits inside of the Quest airlock aboard the International Space Station. **Photo credit:** NASA

Systems, Controls and Legal Compliance

NASA's Internal Control Framework

The Federal Managers' Financial Integrity Act (FMFIA) requires agency heads to evaluate and report on the internal control and financial systems to ensure the integrity of Federal programs and operations. This evaluation aims to provide reasonable assurance that internal controls are operating effectively to ensure efficient operations, reliable financial reporting, and compliance with applicable laws and regulations.

Internal control is at the core of NASA fulfilling its mission and achieving its goals while safeguarding governmental resources. NASA management is responsible for implementing internal control activities that are appropriate to their department's processes. NASA's policy is to comply with OMB Circular A-123, which provides Government-wide requirements for internal control and accountability, based on the FMFIA. OMB Circular A-123 also requires agencies to establish internal controls over their programs, financial reporting, and financial management systems.

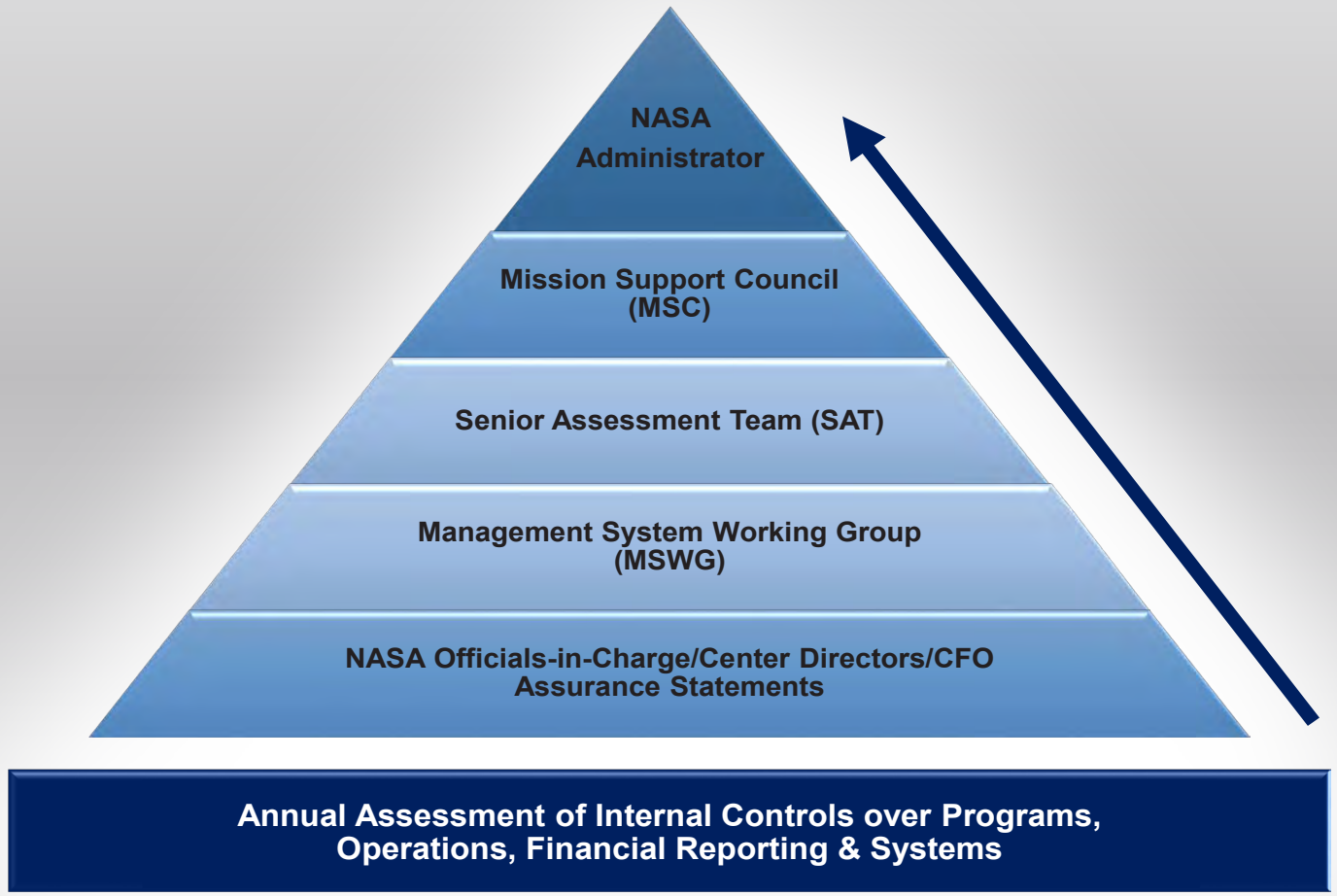
NASA evaluates internal control across the Agency at various levels of the organization to ensure significant risks are identified, and related internal controls are tested and evaluated. NASA evaluates the effectiveness of the internal controls over operations, management systems, and financial reporting with consideration of reviews and other relevant sources of information.

NASA management is responsible for establishing and maintaining effective internal controls in its respective areas of responsibility. As part of this responsibility, management regularly evaluates internal controls, and NASA executive leadership provides annual assurance statements reporting on the effectiveness of internal controls at meeting objectives. In addition, the NASA Office of the Chief Financial Officer (OCFO) deploys an extensive annual testing and assessment methodology that evaluates internal controls over financial reporting.

The FMFIA assurance statement is primarily based on individual assurance statements submitted by NASA Officials-in-Charge. These statements are based upon organizational self-assessments that are informed by various sources of information such as internal reviews of controls, as well as recommendations for improvements from external audits, investigations, and reviews conducted by the Office of Inspector General (OIG) and the Government Accountability Office (GAO). The Mission Support Council (MSC), the organization responsible for oversight of NASA's Internal Control Program, advises the Administrator on the Statement of Assurance. The Senior Assessment Team (SAT), which is an arm of the MSC, helps guide the internal control evaluation and reporting process. The Management System Working Group (MSWG) performs the first-level evaluation of annual results and serves as the primary advisory body for NASA internal control activities. The MSWG analyzes the annual assessment results and reports issues that may significantly impact the effective design and operation of internal controls to the SAT. An illustration of the Annual Statement of Assurance process is included below.

NASA FMFIA

Annual Statement of Assurance Process



Management Assurances

Administrator's Statement of Assurance

November 15, 2016

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), and related statutory and Federal policy guidance. NASA recognizes 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 actively engaged 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 2016 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 Enterprise Risk Management and Internal Control*. Based on the results of this evaluation, NASA provides reasonable assurance that its system of internal control over the effectiveness and efficiency of operations and compliance with applicable laws and regulations as of September 30, 2016, was 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 (OCFO) 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 this evaluation, NASA can provide reasonable assurance that its internal control over financial reporting as of June 30, 2016, was operating effectively and no material weaknesses were found in the design or operation of the internal control over financial reporting. Further, subsequent procedures and testing through September 30 did not identify any material changes in key financial reporting internal controls.

NASA also conducted its evaluation of financial management systems for compliance with FFMIA in accordance with Appendix D of OMB Circular A-123, Federal accounting standards, and the United States Government Standard General Ledger at the transaction level. All NASA financial management systems substantially comply with FFMIA as of September 30, 2016.

In conclusion, NASA makes an unmodified statement of assurance that its internal controls for FY 2016 were operating effectively.

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

Charles F. Bolden, Jr.
Administrator

Financial Systems Strategies

NASA's financial system strategy is to establish an overarching roadmap that aligns with the Agency's mission and the strategic goal to 'serve the American public and accomplish our Mission by effectively managing our people technical capabilities, and infrastructure'. This alignment is accomplished by utilizing a standard software development model with release planning and providing oversight/understanding of new external and internal requirements from stakeholders. The goal is to lead innovative financial systems initiatives that improve and enable integrated solutions while seeking opportunities to enhance business processes and system efficiencies.

Since initial implementations, all of the tools below have been enhanced and expanded for changing policies, standards, OMB requirements, and internal assessments to ensure sound internal and system controls. As a result of NASA's efforts to continually enhance Financial and Budgetary tools/ systems, an unmodified opinion has been achieved for the last 6 years, and resulted in improved budgetary deliverables in accordance with previously capitalized congressional direction.

NASA's Core Financial (CF) and budget management systems include the Systems Applications & Products (SAP) Enterprise Resources Planning (ERP) and the e-budget suite of tools. The CF system has served as NASA's financial accounting system of record since 2003, and the e-budget tools have supported budget formulation and Congressional presentation/justification since 2007. NASA also integrates a procurement writing application (PRISM) with SAP, which provide the foundation for NASA's ability to achieve its financial management objectives and management of the budget. Transactions within the integrated modules and interfaces are recorded on a real-time basis. The CF system is supported by other commercial off-the-shelf (COTS) software, NASA developed applications, and interfaces with systems managed by other Federal agencies.

NASA's goal is also to transform the IT infrastructure and application capabilities and services to meet evolving stakeholder needs and support mission success. To accomplish the first task of meeting stakeholder needs, NASA continues efforts to expand implementation of e-invoicing capabilities to meet OMB's directive M-15- 19, *Improving Government Efficiency and Saving Taxpayer Dollars Through Electronic Invoicing.* This expansion includes improved accounts payable business processes, a single Agency-wide electronic solution, and significantly reduced manual invoice data entry. NASA is on target to meet the FY 2018 timeline to implement expanded eInvoicing. Additionally, NASA is developing the Digital Accountability and Transparency Act (DATA) (PL-113-101) solution with implementation targeted for third quarter of FY 2017. Further, NASA met and supported a variety of reporting requirements mandated by the GPRAMA, Congress, the Office of Management and Budget (OMB), and the Government Accountability Office (GAO). The Strategic Objective Annual Review (SOAR) dashboard was upgraded to increase the integration and aggregation of critical Agency data. Additional highlights include integrated budget data, improved automated performance reports, as well as investigating ways to increase systems interoperability, 508 compliance, and support multiple data output formats.

To accomplish the second task of supporting mission success, NASA is nearing completion of activities to replace PRISM with SAP's end-to-end Procurement for Public Sector (PPS) module. PRISM is near end-of-life support and contains inefficient functionality gaps, so the PPS solution will bring a contract management solu-

tion to provide an Agency tool supporting paperless contracting, contract writing, data management, and procurement workload management. PPS is on target for March 2017 implementation. Additionally, NASA is collecting information on stand-alone Budget and Financial systems and applications portfolios. The first objective is to collect information about these unique financial applications and systems so their capabilities can be leveraged to improve business and management practices. This initiative will reduce systems and applications footprint, improve efficiencies, and provide cost savings to the Agency.

NASA's continued development of the Performance Measures Manager Extension (PMMe) products have greatly improved the availability of and timely access to Agency performance data that is utilized in performance planning and performance reporting activities. In the next development cycle, the Agency plans to continually support and improve upon the current business process. This planned development of new functionality, reporting products, and upgrades to enhance existing products will help support and augment existing processes and a variety of reporting requirements mandated by internal and external stakeholders.

NASA continues to automate the Continuous Monitoring Program (CMP) which provides the overall framework of management controls used to assess and evaluate internal controls, compliance with Generally Accepted Accounting Principles (GAAP), and evidence that balances and activities reported in the financial statements are auditable, accurate and complete. Automating the CMP through one entity provides centralized development, maintenance, and standardization across NASA and leads to improved efficiency.

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Section 2

Financial Section

The team that will be installing the James Webb Space Telescope's (Webb) science instruments gathers to discuss the upcoming operation. The Webb is on the assembly stand, face-down, behind them. This cleanroom is at NASA Goddard Space Flight Center. **Photo Credit:** NASA/Chris Gunn

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CFO Letter

November 15, 2016

On behalf of the National Aeronautics and Space Administration (NASA), I am pleased to present the Fiscal Year (FY) 2016 financial highlights and financial statements. This Agency Financial Report (AFR) represents our accountability in reporting for FY 2016. To complement the AFR, we will publish the FY 2018 Congressional Budget Justification and FY 2016 Annual Performance Report and FY 2018 Annual Performance Plan, in early 2017.

As demonstrated throughout this AFR, NASA is committed to the highest standards of financial accountability in support of the Nation's aeronautics and space missions executed around the world. The AFR is the cornerstone of our efforts to provide transparent, meaningful financial information to the American public and to demonstrate the Agency's effective stewardship of the finite resources entrusted to us.

The AFR represents the work and dedication displayed every day by the Agency's workforce, the Office of Inspector General, and our independent external auditors. The AFR sits at the intersection between NASA's programs and financial management. The Agency's science, research, and technology development work is implemented through over 40 programs by four Mission Directorates, and supported by one Mission Support Directorate. As the complexity and diversity of our mission portfolio grows, the Agency's financial systems and processes evolve to meet expanding program, management, and other stakeholder information needs.

This AFR represents the complexity of financing our operations, through a combination of public-private partnerships and relationships/agreements with a multitude of other Federal agencies to achieve our respective missions. Similar to the progress in our mission portfolios, NASA continues to make progress in the effectiveness of our financial management practices and systems. For example, this year NASA:

- Conducted business process design and documentation initiatives for NASA's Travel and Agreements processes, and initiated efforts for the Agency's Real Property valuation and recordation processes. These initiatives bring Agency-wide stakeholders together to define, document, and improve the critical business processes that impact financial statement accounts.

- Updated its methodology for estimating asbestos cleanup liability by using existing asbestos survey data from certain NASA Centers and industry standard asbestos cleanup cost estimates to develop an Agency-wide asbestos cleanup cost factor. This change in methodology provides an estimate that more closely reflects the potential cost to cleanup asbestos across NASA Centers and facilities.

- Initiated an Enterprise Risk Management (ERM) activity which included a review of the existing NASA governance structure. The goal is to ensure continued integration of strategic planning, risk identification, and risk management, in conjunction with performance reviews and other key management activities. The ERM activity is designed to develop a more robust enterprise-level risk management focus, while leveraging NASA's existing mature risk management processes and activities at the operational level.

- Enhanced OCFO's Performance Management Systems to increase the integration and aggregation of critical Agency data. Highlights include integrated budget data at the strategic objective, directorate, and program levels. Additional improvements were introduced into the Agency's automated performance reports and overall accessibility of performance data was increased.

- Continued to make significant progress in meeting the requirements for the Digital Accountability and Transparency Act (DATA Act) and expanding e-Invoicing solutions. NASA is on target to implement these initiatives as prescribed by OMB.

As evidence that our efforts continue to have tangible results, I am pleased to report that NASA remains in substantial compliance with the Federal Financial Management Improvement Act (FFMIA). I also take great pride in reporting that for the sixth year in a row NASA received an unmodified "clean" audit opinion on our FY 2016 financial statements, with no material weaknesses. This year's opinion identifies one significant deficiency related to information technology and one noncompliance with certain provisions of Title 2 of the Code of Federal Regulations, *Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards*. NASA takes these issues seriously and is developing plans toward addressing the reported issues as soon as possible. With regard to noncompliance with the Single Audit Act, NASA has appointed both a Single Audit Accountable Official (SAAO) and Key Management Single Audit Liaison (KMSAL), and under their oversight, NASA is positioned to resolve the remaining issues in FY 2017.

The financial highlights that follow explain how we used the funds entrusted to us to perform our mission and achieve the results described in this AFR's Mission Performance section. In the Financial section, we provide our audited financial statements, accompanying notes, and the independent auditors' opinion on our financial statements.

I am pleased with our achievements and remain committed to ensuring sound financial management that delivers reliable and actionable information for both internal and external decision makers and stakeholders. I appreciate the immense dedication of the entire Agency, with special thanks to the Office of Inspector General.

David P. Radzanowski
Chief Financial Officer

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) Circular No. A-136, *Financial Reporting Requirements, Revised* (October 2016). 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 2015 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 costs of operations during the reporting periods by strategic goal and at the entity level. It is a measure of gross costs of operations less earned revenue and represents cost to taxpayers for achieving each strategic goal and Agency gross cost of operations mission at the entity level.

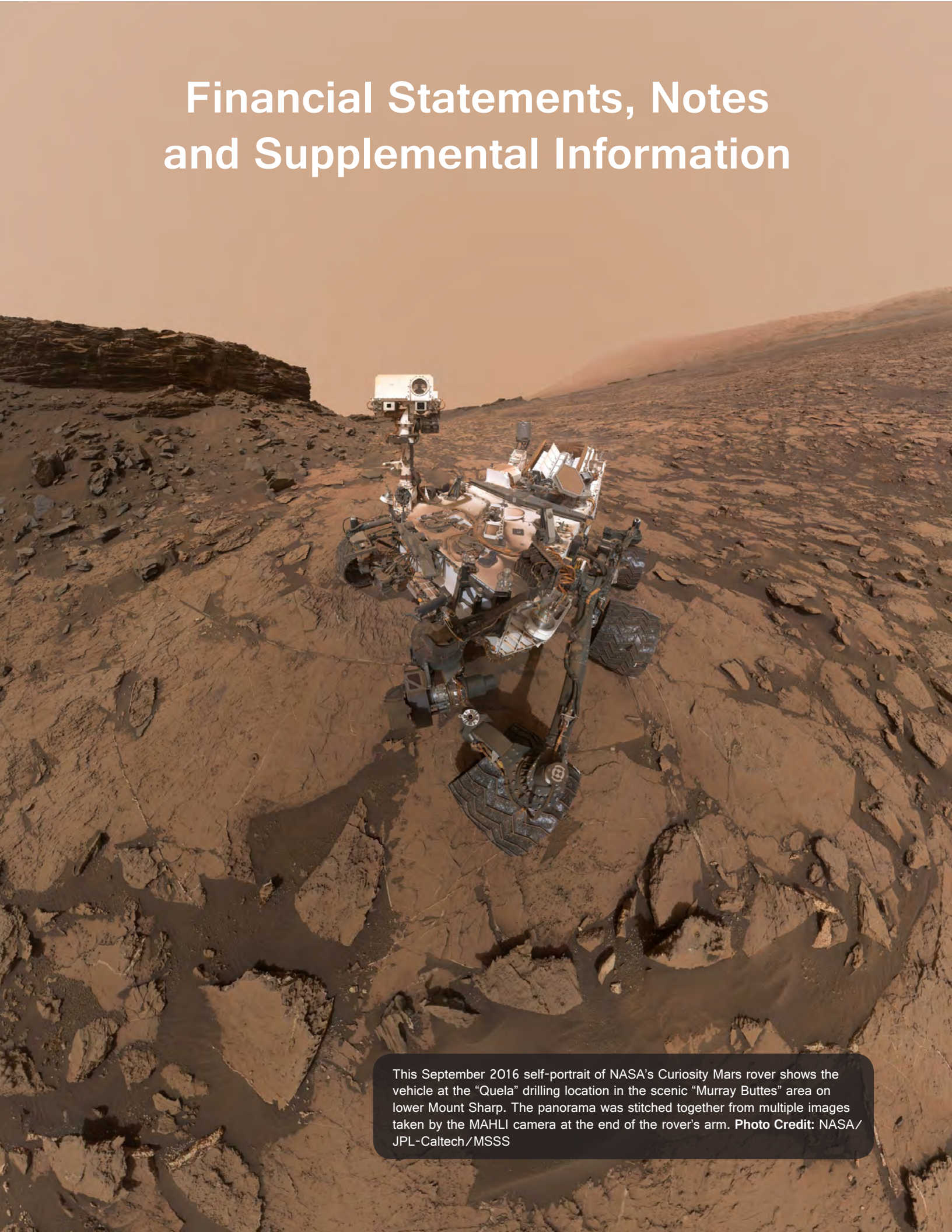
- **Consolidated Statement of Changes in Net Position** reports the beginning balance of net position, current financing sources and use of resources, unexpended resources for the reporting period, and ending net position for the current period.

- **Combined Statement of Budgetary Resources** reports information on resources 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



This September 2016 self-portrait of NASA's Curiosity Mars rover shows the vehicle at the "Quela" drilling location in the scenic "Murray Buttes" area on lower Mount Sharp. The panorama was stitched together from multiple images taken by the MAHLI camera at the end of the rover's arm. **Photo Credit:** NASA/JPL-Caltech/MSSS

National Aeronautics and Space Administration
Consolidated Balance Sheet
As of September 30, 2016 and 2015

(In Millions of Dollars)

	2016	2015
Assets (Note 2):		
Intragovernmental:		
Fund Balance with Treasury (Note 3)	$ 10,408	$ 9,980
Investments (Note 4)	18	17
Accounts Receivable (Note 5)	146	191
Other Assets (Note 8)	2	6
Total Intragovernmental	10,574	10,194
Accounts Receivable, Net (Note 5)	1	2
General Property, Plant and Equipment, Net (Note 6)	6,262	6,782
Other Assets (Note 8)	1	1
Total Assets	**$ 16,838**	**$ 16,979**
Stewardship PP&E (Note 7)		
Liabilities (Note 9):		
Intragovernmental:		
Accounts Payable	$ 39	$ 38
Other Liabilities (Note 11)	109	120
Total Intragovernmental	148	158
Accounts Payable	1,284	1,417
Federal Employee and Veteran's Benefits	38	43
Environmental and Disposal Liabilities (Note 10)	1,599	1,412
Other Accrued Liabilities (Note 11)	1,316	1,372
Other Liabilities (Note 11)	468	409
Total Liabilities	**4,853**	**4,811**
Commitments and Contingencies (Note 12)		
Net Position:		
Unexpended Appropriations	7,519	6,988
Cumulative Results of Operations	4,466	5,180
Total Net Position	**11,985**	**12,168**
Total Liabilities and Net Position	**$ 16,838**	**$ 16,979**

The accompanying notes are an integral part of these financial statements.

National Aeronautics and Space Administration
Consolidated Statement of Net Cost
For the Fiscal Years Ended September 30, 2016 and 2015

(In Millions of Dollars)

	2016	2015
Cost by Strategic Goal (Note 13)		
Strategic Goal 1 – Expand the frontiers of knowledge, capability, and opportunity in space:		
Gross Costs	$ 12,652	$ 12,962
Less: Earned Revenue	317	318
Net Costs	12,335	12,644
Strategic Goal 2 – Advance understanding of Earth and develop technologies to improve the quality of life on our home planet:		
Gross Costs	$ 3,841	$ 3,741
Less: Earned Revenue	1,779	1,839
Net Costs	2,062	1,902
Strategic Goal 3 – Serve the American public and accomplish our Mission by effectively managing our people, technical capabilities, and infrastructure:		
Gross Costs	$ 5,318	$ 5,158
Less: Earned Revenue	121	134
Net Costs	5,197	5,024
Net Cost of Operations		
Total Gross Costs	$ 21,811	$ 21,861
Less: Total Earned Revenue	2,217	2,291
Net Cost	**$ 19,594**	**$ 19,570**

The accompanying notes are an integral part of these financial statements.

National Aeronautics and Space Administration
Consolidated Statement of Changes in Net Position
For the Fiscal Years Ended September 30, 2016 and 2015

(In Millions of Dollars)

	2016	2015
Cumulative Results of Operations:		
Beginning Balances	$ 5,180	$ 6,182
Budgetary Financing Sources:		
Appropriations Used	18,727	18,381
Nonexchange Revenue	7	4
Other Financing Sources:		
Donations and Forfeitures of Property	2	—
Transfers In/Out Without Reimbursement	1	31
Imputed Financing	149	156
Other	(6)	(4)
Total Financing Sources	18,880	18,568
Net Cost of Operations	(19,594)	(19,570)
Net Change	(714)	(1,002)
Cumulative Results of Operations	**4,466**	**5,180**
Unexpended Appropriations:		
Beginning Balance	6,988	7,413
Budgetary Financing Sources:		
Appropriations Received	19,285	18,010
Appropriations Transferred In/Out	—	2
Other Adjustments	(27)	(56)
Appropriations Used	(18,727)	(18,381)
Total Budgetary Financing Sources	531	(425)
Unexpended Appropriations	**7,519**	**6,988**
Net Position	**$ 11,985**	**$ 12,168**

The accompanying notes are an integral part of these financial statements.

National Aeronautics and Space Administration
Combined Statement of Budgetary Resources
For the Fiscal Years Ended September 30, 2016 and 2015

(In Millions of Dollars)

	2016	2015
Budgetary Resources:		
Unobligated Balance, Brought Forward, October 1	$ 1,104	$ 1,151
Recoveries of Prior Year Unpaid Obligations	243	256
Other Changes in Unobligated Balance	(16)	(41)
Unobligated Balance from Prior Year Budget Authority, Net	1,331	1,366
Appropriations	19,286	18,013
Spending Authority from Offsetting Collections	3,002	2,796
Total Budgetary Resources	**$ 23,619**	**$ 22,175**
Status of Budgetary Resources:		
New Obligations and Upward Adjustments (Total) (Note 14)	$ 22,527	$ 21,071
Unobligated Balance, End of Year:		
Apportioned, Unexpired Accounts	994	1,016
Unapportioned, Unexpired Accounts	2	2
Unexpired Unobligated Balance, End of Year	996	1,018
Expired Unobligated Balance, End of Year	96	86
Unobligated Balance, End of Year (Total)	1,092	1,104
Total Status of Budgetary Resources	**$ 23,619**	**$ 22,175**
Change in Obligated Balance:		
Unpaid Obligations:		
Unpaid Obligations, Brought Forward, October 1	$ 9,969	$ 10,124
New Obligations and Upward Adjustments (Total) (Note 14)	22,527	21,071
Outlays (Gross) (-)	(21,508)	(20,970)
Recoveries of Prior Year Unpaid Obligations (-)	(243)	(256)
Unpaid Obligations, End of Year	10,745	9,969
Uncollected Payments:		
Uncollected Payments, Federal Sources, Brought Forward, October 1 (-)	(1,105)	(988)
Change in Uncollected Payments, Federal Sources	(339)	(117)
Uncollected Payments, Federal Sources, End of Year (-)	(1,444)	(1,105)
Memorandum (Non-Add) Entries		
Obligated Balance, Start of Year	**8,864**	**9,136**
Obligated Balance, End of Year	**$ 9,301**	**$ 8,864**
Budget Authority and Outlays, Net:		
Budget Authority, Gross	$ 22,288	$ 20,809
Actual Offsetting Collections (-)	(2,674)	(2,694)
Change in Uncollected Payments, Federal Sources	(339)	(117)
Recoveries of Prior Year Paid Obligations	11	15
Budget Authority, Net (Total)	**$ 19,286**	**$ 18,013**
Outlays, Gross	$ 21,508	$ 20,970
Actual Offsetting Collections (-)	(2,674)	(2,694)
Outlays, Net (Total)	18,834	18,276
Distributed Offsetting Receipts (-)	(5)	(4)
Agency Outlays, Net	**$ 18,829**	**$ 18,272**

The accompanying notes are an integral part of these financial statements.

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 U.S. Government for initiatives in civil space and aviation.

NASA is organized into four Mission Directorates supported by one Mission Support Directorate (see Organization on page 9):

- 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 and other facilities across the country, the Headquarters Office, the NASA Shared Services Center (NSSC), and the Jet Propulsion Laboratory (JPL). JPL is a Federally Funded Research and Development Center (FFRDC), operated for NASA by a contractor, California Institute of Technology (Caltech), staffed by Caltech employees in NASA-owned facilities.

The Agency's consolidated financial statements present the accounts of all funds that 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 and Federal Accounting Standards Advisory Board (FASAB) standards in the format prescribed by the OMB Circular No. A-136, *Financial Reporting Requirements, Revised* (October 2016). 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. 103-356).

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

Note 1: Summary of Significant Accounting Policies (continued)

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 resources and status of funds to facilitate compliance with legal controls over the use of Federal funds.

Material intra-agency transactions and balances have been eliminated from the principal statements for presentation on a consolidated basis, except for the Statement of Budgetary Resources, which is presented on a combined basis in accordance with OMB Circular No. A-136, *Financial Reporting Requirements, Revised* (October 2016).

Budgets and Budgetary Accounting

NASA complies with Federal budgetary accounting guidelines of OMB Circular No. A-11, *Preparation, Submission and Execution of the Budget, Revised* (July 2016). Congress funds NASA's operations through nine main appropriations: Science; Aeronautics; Exploration; Space Operations; Education; Safety, Security and Mission Services; Space Technology; Office of Inspector General; and Construction and Environmental Compliance and Restoration. NASA also receives reimbursements from reimbursable service agreements that cover the cost of goods and services NASA provides to other Federal entities or non-Federal entities. The reimbursable agreement price is based on cost principles to reasonably reflect the actual cost for the goods and services provided to the customer.

Research and Development, Other Initiatives and Similar Costs

NASA makes substantial Research and Development (R&D) investments for the benefit of the U.S. 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.

Application of Critical Accounting 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 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 account with Treasury.

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 reinvested 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 the 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 entities. Allowances for delinquent non-Federal accounts receivable are based on factors such as: aging of accounts receivable, debtors' ability to pay, payment history, and other relevant factors. Delinquent non-Federal accounts receivable over 120 days are referred to Treasury for collection, wage garnishment, or cross-servicing in accordance with the Debt Collection Improvement Act (DCIA). The Digital Accountability and Transparency Act of 2014 (DATA Act) amended the DCIA requirement of 180 days to 120 days.

Operating Materials and Supplies

The Agency follows the purchases method of accounting for operating materials and supplies under which it expenses operating materials and supplies when purchased, not when used.

General 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. General Property, Plant and Equipment (G-PP&E) are assets with acquisition costs of $500,000 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. 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.

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. NASA has received some assets from these parties in

Note 1: Summary of Significant Accounting Policies (continued)

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 2 years or more. NASA updated the required expected useful life criteria for internal use software from 5 years to 2 years in FY 2016. Additionally, beginning in FY 2016, NASA implemented Technical Release 16, *Implementation Guidance for Internal Use Software*, to apply existing standards to internal use software.

Beginning FY 2015, NASA implemented SFFAS No. 44, *Accounting for Impairment of General Property, Plant, and Equipment Remaining in Use*, to recognize and report permanent impairment losses to G-PP&E remaining in use except internal use software as required. G-PP&E is considered impaired when there is a significant and permanent decline in the service utility of G-PP&E or expected service utility for construction work in process. There are existing processes and internal controls in place to reasonably assure identification and communication of potential material impairments; therefore, NASA does not conduct a periodic survey solely for the purpose of implementing these standards. NASA recognizes an impairment loss as a result of applying these standards as applicable.

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. Budgetary resources include: new budget authority, unobligated balances of budgetary resources at the beginning of the year or net transfers of prior year balances during the year, spending authority from offsetting collections (credited to an appropriation or fund account), and recoveries of unexpired budget authority through downward adjustments of prior year obligations.

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 Veteran's 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 13.7 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.

Reclassification of FY 2015 Information

Certain reclassifications have been made to FY 2015 financial statements, footnotes, and supplemental information to better align with the Agency's policies and procedures effective in FY 2016, in accordance with the OMB Circular A-136.

Subsequent Events

Subsequent events have been evaluated through the auditors' report date, which is the date the financial statements were available to be issued, and management determined that there are no other items to disclose.

Note 2: Non-Entity Assets

Non-entity assets are assets held by NASA but not available for obligation. NASA's non-entity assets comprise of activities such as the Freedom of Information Act (FOIA), Civil Monetary Penalties and Interest, Penalty and Administration Fees received.

(In Millions of Dollars)	2016	2015
Total Non-Entity Assets	$ —	$ —
Total Entity Assets	16,838	16,979
Total Assets	**$ 16,838**	**$ 16,979**

Note 3: Fund Balance with Treasury

NASA's cash receipts and disbursements reported by Treasury are reconciled against NASA's records. 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. The Working Capital Fund (WCF) consists of balances related to NSSC, IT Infrastructure Integration Program (I3P) and Solutions for Enterprise-Wide Procurement (SEWP). Other fund types include Deposit funds and Budget Clearing funds.

(In Millions of Dollars)	2016	2015
Fund Balances:		
General Funds	$ 10,211	$ 9,796
Trust Funds	1	1
Working Capital Fund	180	171
Other Fund Types	16	12
Total	**$ 10,408**	**$ 9,980**

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 appropriated funds available for obligation. Unobligated Balances — Unavailable is the amount remaining in appropriated 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 fund types.

(In Millions of Dollars)	2016	2015
Status of Fund Balances with Treasury:		
Unobligated Balances		
Available	$ 994	$ 1,016
Unavailable	98	88
Obligated Balance Not Yet Disbursed	9,301	8,864
Non-Budgetary FBWT	15	12
Total	**$ 10,408**	**$ 9,980**

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 was more than temporary.

Note 4: Investments (continued)

2016							
(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	$ 21	Effective-interest 0.476 - 6.602%	$ (3)	$ —	$ 18	$ —	$ 18
Total	**$ 21**		**$ (3)**	**$ —**	**$ 18**	**$ —**	**$ 18**

2015							
(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	$ 20	Effective-interest 0.115 - 6.602%	$ (3)	$ —	$ 17	$ —	$ 17
Total	**$ 20**		**$ (3)**	**$ —**	**$ 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 Accounts Receivable Due from the Public 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 2016 and FY 2015 is less than one-half million dollars.

2016			
(In Millions of Dollars)	Accounts Receivable	Allowance for Uncollectible Accounts	Net Amount Due
Intragovernmental	$ 146	$ —	$ 146
Public	1	—	1
Total	**$ 147**	**$ —**	**$ 147**

Note 5: Accounts Receivable, Net (continued)

2015			
(In Millions of Dollars)	Accounts Receivable	Allowance for Uncollectible Accounts	Net Amount Due
Intragovernmental	$ 191	$ —	$ 191
Public	2	—	2
Total	**$ 193**	**$ —**	**$ 193**

Note 6: General Property, Plant and Equipment, Net

Beginning October 1, 2014, NASA increased the capitalization threshold from $100,000 to $500,000 for personal and real property. Assets acquired prior to October 1, 2014, were capitalized at the prior threshold of $100,000 or more.

The composition of NASA G-PP&E as of September 30, 2016 and 2015 is presented in the table below. There are no known restrictions to the use or convertibility of NASA G-PP&E.

2016					
(In Millions of Dollars)	Method	Useful Life	Cost	Depreciation	Book Value
General PP&E					
International Space Station	Straight-line	5–20 years	$ 12,773	$ (12,582)	$ 191
Structures, Facilities and Leasehold Improvements	Straight-line	15-40 years	10,232	(7,419)	2,813
Equipment	Straight-line	5–20 years	3,162	(2,070)	1,092
Construction In Progress - Personal Property	N/A	N/A	1,210	—	1,210
Construction In Progress - Real Property	N/A	N/A	823	—	823
Internal Use Software	Straight-line	5 years	280	(271)	9
Land	N/A	N/A	124	—	124
Total			**$ 28,604**	**$ (22,342)**	**$ 6,262**

2015					
(In Millions of Dollars)	Method	Useful Life	Cost	Depreciation	Book Value
General PP&E					
International Space Station	Straight-line	5–20 years	$ 12,865	$ (12,170)	$ 695
Structures, Facilities and Leasehold Improvements	Straight-line	15-40 years	9,983	(7,198)	2,785
Equipment	Straight-line	5–20 years	3,161	(1,993)	1,168
Construction In Progress - Personal Property	N/A	N/A	1,210	—	1,210
Construction In Progress - Real Property	N/A	N/A	787	—	787
Internal Use Software	Straight-line	5 years	280	(265)	15
Land	N/A	N/A	122	—	122
Total			**$ 28,408**	**$ (21,626)**	**$ 6,782**

Note 7: Stewardship PP&E

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

Stewardship PP&E have physical characteristics similar to those of 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 PP&E that 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 PP&E as a heritage asset, and depreciation expense is not taken on these assets. For these reasons, heritage assets (other than multi-use 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.

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 G-PP&E and are capitalized and depreciated in the same manner as other G-PP&E. Multi-use heritage assets at the end of the period totaled 70 buildings and structures as of September 30, 2016 and September 30, 2015. 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 has no use in operations, but is designated as a 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 the heritage asset record. 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 that 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.

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Note 7: Stewardship PP&E (continued)

Heritage Assets *(In Physical Units)*	FY2015	Additions	Withdrawals	FY2016
Buildings and Structures	12	—	1	11
Air and Space Displays and Artifacts	616	78	4	690
Art and Miscellaneous Items	1,027	20	—	1,047
Total Heritage Assets	**1,655**	**98**	**5**	**1,748**

Note 8: Other Assets

NASA's Other Assets consist of Intragovernmental Advances and G-PP&E that NASA determines are no longer needed and are awaiting disposal, retirement, or removal from services. The Intragovernmental Advances are reported at cost and primarily represent the payments made to the Army Corps of Engineers in support of the construction of the Computational Research Facility at Langley Research Center. The G-PP&E Other Assets are recorded at estimated net realizable value.

(In Millions of Dollars)	2016	2015
Intragovernmental Assets		
Other Advances	$ 2	$ 6
Non-Intragovernmental Assets		
General PP&E - Removed from Service and Pending Disposal	1	1
Total Other Assets	**$ 3**	**$ 7**

Note 9: Liabilities Not Covered by Budgetary Resources

Liabilities not covered by budgetary resources include certain environmental liabilities (see Note 10, Environmental liabilities 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 2.78 percent in FY 2016 and 3.13 percent in FY 2015. 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 an invoice is processed, in accordance with P.L. 101-510, National Defense Authorization Act.

Note 9: Liabilities Not Covered by Budgetary Resources (continued)

(In Millions of Dollars)	2016	2015
Intragovernmental Liabilities:		
Other Liabilities		
Workers' Compensation	$ 9	$ 10
Total Intragovernmental	9	10
Public Liabilities:		
Accounts Payable		
Accounts Payable for Cancelled Appropriations	56	49
Federal Employee and Veterans Benefits		
Actuarial FECA Liability	38	43
Environmental and Disposal Liabilities	1,599	1,412
Less: Environmental and Disposal Liabilities - Funded	87	82
Other Liabilities		
Unfunded Annual Leave	211	208
Contingent Liabilities	40	1
Total Liabilities Not Covered by Budgetary Resources	**1,866**	**1,641**
Total Liabilities Covered by Budgetary Resources	**2,987**	**3,170**
Total Liabilities	**$ 4,853**	**$ 4,811**

Note 10: Environmental and Disposal Liabilities

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

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; and applicable state and local laws.

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 or estimate is recorded or 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 PP&E.

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Note 10: Environmental and Disposal Liabilities (continued)

(In Millions of Dollars)	2016	2015
Environmental Liabilities		
Restoration Projects	$ 1,402	$ 1,324
Asbestos	128	22
Property, Plant & Equipment	69	66
Total Environmental and Disposal Liabilities	**$ 1,599**	**$ 1,412**

Restoration Projects

NASA recorded a total estimated liability for known restoration projects of $1.4 billion in FY 2016. This was an increase of $78 million over the $1.3 billion recorded in FY 2015. 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.

The liability for each restoration project is estimated for a duration of no more than 30 years except for state statutes, regulations, or an agreement. 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 2016 and $6 million for FY 2015.

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.

Asbestos

NASA maintains numerous structures and facilities across each of the Centers that are known to contain asbestos. In accordance with FASAB Technical Bulletin 2006-1, *Recognition and Measurement of Asbestos Related Cleanup Costs,* NASA and other Federal entities are required to recognize a liability for probable asbestos cleanup costs. FASAB Technical Release 10, *Implementation Guidance on Asbestos Cleanup Costs Associated with Facilities and Installed Equipment,* allows for an extrapolation of asbestos cleanup cost estimates for similar properties and the use of industry specific cost estimation publications to develop an Agency-wide cleanup estimate.

In FY 2016, NASA updated its methodology for estimating asbestos liability by using existing asbestos survey data from certain NASA Centers and industry standard asbestos cleanup cost estimates to develop an Agency-wide asbestos cleanup cost factor. This cost factor is extrapolated across applicable NASA structures and facilities measured in square feet. For structures and facilities not measured in square feet, NASA records the cost to perform site specific surveys. The sum of these two estimates yields the total Agency-wide estimated asbestos liability. The increase in this liability from FY 2015 is due to the new estimation methodology, which was recorded prospectively as a change in estimate.

The cost to prepare the site for abatement work and to transport and dispose of removed asbestos is probable but not reasonably estimable at this time; therefore, a liability has not been estimated for these costs.

End of Life Disposal of Property, Plant & Equipment

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

NASA recorded a total estimated liability for the end of life disposal of PP&E of $69 million in FY 2016. This was an increase of $3 million over the $66 million recorded in FY 2015. This estimate includes both facilities with permits that require cleanup and an estimate for all remaining PP&E. As described below, this estimate also considers end-of-life disposal costs for assets in space, including the ISS and satellites.

The current proposed decommissioning approach for the 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.

Note 11: Other Liabilities and Other Accrued Liabilities

Intragovernmental Other Liabilities primarily represent accrued cost estimates for goods and services performed by Federal trading partners, and Advances from Others relates to agreements for services between NASA and Federal trading partners for reimbursable services performed. Other Liabilities with public entities primarily represents unfunded annual leave and funded sick leave that has been earned but not taken by NASA employees, and Advances from Others primarily consists of payments received from non-Federal entities in advance of NASA's performance of services under reimbursable agreements.

Other Accrued Liabilities primarily consist of the accrual of contractor costs for goods and services performed. The period of performance for 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. Other Accrued Liabilities also include the accrual of incurred but not reported (IBNR) grant program costs incurred in support of NASA research and development and other related activities.

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Note 11: Other Liabilities and Other Accrued Liabilities (continued)

	2016			2015		
(In Millions of Dollars)	Current	Non-Current	Total	Current	Non-Current	Total
Intragovernmental Liabilities:						
Advances from Others	$ 25	$ —	$ 25	$ 41	$ —	$ 41
Workers' Compensation	4	5	9	4	6	10
Employer Contributions and Payroll Taxes	16	—	16	12	—	12
Other	59	—	59	57	—	57
Total Intragovernmental	**104**	**5**	**109**	**114**	**6**	**120**
Public Liabilities:						
Unfunded Annual Leave	—	211	211	—	208	208
Accrued Funded Payroll	81	—	81	64	—	64
Advances from Others	112	—	112	118	—	118
Employer Contributions and Payroll Taxes	8	—	8	6	—	6
Liability for Deposit and Clearing Funds	16	—	16	12	—	12
Contingent Liabilities	—	40	40	—	1	1
Total Other Liabilities	217	251	468	200	209	409
Other Accrued Liabilities	1,316	—	1,316	1,372	—	1,372
Total Public	**1,533**	**251**	**1,784**	**1,572**	**209**	**1,781**
Total Other Liabilities/ Other Accrued Liabilities	**$ 1,637**	**256**	**1,893**	**$ 1,686**	**$ 215**	**$ 1,901**

Note 12: Commitments and Contingencies

NASA is a party in various administrative proceedings, court actions (including tort suits), and claims. For cases in 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 cases reviewed by legal counsel where the probable future measurable loss is remote, and as such no contingent liability has been recorded in connection with these cases.

There are certain cases where the likelihood of loss is reasonably possible, with the loss estimated up to $150 million for September 30, 2016.

There are certain 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.

(In Millions of Dollars)	2016	2015
Contingent Liabilities	$ 40	$ 1
Total Contingent Liabilities	**$ 40**	**$ 1**

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, primarily through reimbursable agreements. Reimbursable agreements are priced based on cost principles to reasonably reflect the actual cost for the goods and services provided to the customer.

(In Millions of Dollars)	2016	2015
Strategic Goal 1 – Expand the frontiers of knowledge, capability, and opportunity in space		
Intragovernmental Costs	$ 400	$ 381
Public Costs	12,252	12,581
Total Gross Costs	12,652	12,962
Less:		
Intragovernmental Earned Revenue	204	231
Public Earned Revenue	113	87
Total Earned Revenue	317	318
Net Cost	**$ 12,335**	**$ 12,644**
Strategic Goal 2 – Advance understanding of Earth and develop technologies to improve the quality of life on our home planet		
Intragovernmental Costs	$ 148	$ 155
Public Costs	3,693	3,586
Total Gross Costs	3,841	3,741
Less:		
Intragovernmental Earned Revenue	1,742	1,792
Public Earned Revenue	37	47
Total Earned Revenue	1,779	1,839
Net Cost	**2,062**	**$ 1,902**
Strategic Goal 3 – Serve the American public and accomplish our Mission by effectively managing our people, technical capabilities, and infrastructure		
Intragovernmental Costs	$ 544	$ 558
Public Costs	4,774	4,600
Total Gross Costs	5,318	5,158
Less:		
Intragovernmental Earned Revenue	39	40
Public Earned Revenue	82	94
Total Earned Revenue	121	134
Net Cost	**$ 5,197**	**$ 5,024**
Net Cost of Operations	**$ 19,594**	**$ 19,570**

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

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

(In Millions of Dollars)	2016	2015
Direct New Obligations and Upward Adjustments:		
Category A	$ 1	$ 1
Category B	19,565	18,273
Reimbursable New Obligations and Upward Adjustments:		
Category B	2,961	2,797
Total New Obligations and Upward Adjustments:	**$ 22,527**	**$ 21,071**

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

The FY 2018 Budget of the United States Government (President's Budget), which presents the actual amounts for the year ended September 30, 2016, has not been published as of the issue date of these financial statements. On approval of the Administration, NASA will publish its FY 2018 President's Budget Request on the NASA web site at: http://www.nasa.gov/news/budget/index.html

NASA reconciled the amounts of the FY 2015 column on the Statement of Budgetary Resources (SBR) to the actual amounts for FY 2015 in the FY 2017 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	$ 22,175	$ 21,071	$ (4)	$ 18,272
Included on SBR, not in President's Budget				
Expired Accounts	(151)	(69)	—	—
Distributed Offsetting Receipts	—	—	4	—
Budget of the United States Government	**$ 22,024**	**$ 21,002**	**$ —**	**$ 18,272**

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's mission objectives, which have not been received. The total Undelivered Orders at the end of the period totaled $8.1 billion and $7.2 billion as of September 30, 2016 and September 30, 2015, respectively.

Note 17: Reconciliation of Net Cost to Budget

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

Note 17: Reconciliation of Net Cost to Budget (continued)

(In Millions of Dollars)	2016	2015
Resources Used to Finance Activities		
Budgetary Resources Obligated		
Obligations Incurred	$ 22,527	$ 21,071
Less: Spending Authority from Offsetting Collections and Recoveries	3,255	3,067
Net Obligations	19,272	18,004
Other Resources		
Donations & Forfeitures of Property	2	—
Transfers In/Out Without Reimbursements	1	31
Imputed Financing from Costs Absorbed by Others	149	156
Net Other Resources Used to Finance Activities	152	187
Total Resources Used to Finance Activities	**19,424**	**18,191**
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	(582)	374
Resources that Fund Expenses Recognized in Prior Periods	(5)	(40)
Resources that Finance the Acquisition of Assets	(625)	(918)
Other Resources or Adjustments to Net Obligated Resources that Do Not Affect Net Cost of Operations	(3)	(31)
Total Resources Used to Finance Items Not Part of the Net Cost of Operations	**(1,215)**	**(615)**
Total Resources Used to Finance the Net Cost of Operations	**$ 18,209**	**$ 17,576**
Components of Net Cost that Will Not Require or Generate Resources in the Current Period		
Components Requiring or Generating Resources in Future Periods		
Increases in Annual Leave Liability	$ 3	$ —
Increases in Environmental and Disposal Liability	187	138
Other	46	8
Total Components of Net Cost that Will Require or Generate Resources in Future Periods	236	146
Components Not Requiring or Generating Resources		
Depreciation	990	1,652
Revaluation of Assets or Liabilities	11	(21)
Other	148	217
Total Components of Net Cost of Operations that Will Not Require or Generate Resources	1,149	1,848
Total Components of Net Cost of Operations that Will Not Require or Generate Resources in the Current Period	**1,385**	**1,994**
Net Cost of Operations	**$ 19,594**	**$ 19,570**

Required Supplementary Stewardship Information

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 (R&D) 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)	2016	2015	2014	2013	2012
Research and Development Costs					
Basic					
Strategic Goal 1	$ 2,227	$ 2,005	$ 2,020	$ 1,728	$ 851
Strategic Goal 2	1,086	1,088	970	1,147	329
Strategic Goal 3	-	(1)	-	-	-
Total Basic Expenses	**$ 3,313**	**$ 3,092**	**$ 2,990**	**$ 2,875**	**$ 1,180**
Applied					
Strategic Goal 1	$ 2,347	$ 1,729	$ 1,828	$ 1,993	$ 1,561
Strategic Goal 2	546	622	578	597	480
Strategic Goal 3	23	-	6	-	-
Total Applied Expenses	**$ 2,916**	**$ 2,351**	**$ 2,412**	**$ 2,590**	**$ 2,041**
Development					
Strategic Goal 1	$ 5,746	$ 5,867	$ 4,980	$ 5,005	$ 3,023
Strategic Goal 2	502	341	434	177	608
Strategic Goal 3	532	32	8	33	-
Total Development Expenses	**$ 6,780**	**$ 6,240**	**$ 5,422**	**$ 5,215**	**$ 3,631**
Total Research and Development	**$ 13,009**	**$ 11,683**	**$ 10,824**	**$ 10,680**	**$ 6,852**
Non-Research and Development Cost					
Strategic Goal 1	$ 2,331	$ 3,361	$ 2,960	$ 2,770	$ 5,222
Strategic Goal 2	1,707	1,690	1,664	1,742	2,137
Strategic Goal 3	4,764	5,127	4,881	5,027	5,818
Total Non-Research and Development Expenses	**$ 8,802**	**$ 10,178**	**$ 9,505**	**$ 9,539**	**$ 13,177**
Total Expenses	**$ 21,811**	**$ 21,861**	**$ 20,329**	**$ 20,219**	**$ 20,029**

NASA makes substantial R&D 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.

Strategic Goals and Outcomes:

Strategic Goal 1: Expand the frontiers of knowledge, capability, and opportunity in space.

Strategic Objective 1.1: Expand human presence into the solar system and to the surface of Mars to advance exploration, science, innovation, benefits to humanity, and international collaboration.

Major Programs Include:

- Orion Multi-Purpose Crew Vehicle Program
- Space Launch System (SLS) Program
- Exploration Ground Systems (EGS) Program
- Advanced Exploration Systems (AES)

Outcomes:

- Achieve critical milestones in development of new systems for the human exploration of deep space.

- Develop a new transportation system that includes a crew capsule, a heavy-lift launch vehicle, and supporting ground facilities and systems.

- Develop the technologies and capabilities for in-space propulsion, in-space operations, long-duration habitation, and other systems to support humans in hostile environments.

Strategic Objective 1.2: Conduct research on the International Space Station (ISS) to enable future space exploration, facilitate a commercial space economy, and advance the fundamental biological and physical sciences for the benefit of humanity.

Major Programs Include:

- International Space Station Program
- Human Research Program
- Human Space Flight Operations Program
- Crew and Cargo Program

Outcomes:

- Sustain the operation and full use of the 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.

- Advance benefits to humanity through research.

- Enable a commercial demand-driven market in low Earth orbit (LEO).

- Enable long-duration human spaceflight beyond LEO.

- Provide a basis for international exploration partnerships.

Strategic Objective 1.3: Facilitate and utilize U.S. commercial capabilities to deliver cargo and crew to space.

Major Programs Include:

- Commercial Crew Program

Outcomes:

- U.S. commercial space transportation capabilities will provide safe, reliable, and cost effective

Strategic Goals and Outcomes:
(continued)

access to and from LEO and the ISS for crew and cargo.

Strategic Objective 1.4: Understand the Sun and its interactions with Earth and the solar system, including space weather.

Major Programs Include:

- Heliophysics Research Program
- Living with a Star Program
- Solar Terrestrial Probes Program
- Heliophysics Explorer Program

Outcomes:

- Increased understanding of the heliosphere (the extended atmosphere of the Sun), including what causes the Sun to vary, how do the geospace, planetary space environments, and the heliosphere respond, and what are the impacts on humanity.

Strategic Objective 1.5: Ascertain the content, origin, and evolution of the solar system and the potential for life elsewhere.

Major Programs Include:

- Planetary Science Research Program
- Discovery Program
- New Frontiers Program
- Mars Exploration Program
- Outer Planets Program
- Planetary Technology Program

Outcomes:

- Continue to expand knowledge of the solar system, seeking to answer fundamental questions: How did our solar system form and evolve? Is there life beyond Earth? What are the hazards to life on Earth?

Strategic Objective 1.6: Discover how the universe works, explore how it began and evolved, and search for life on planets around other stars.

Major Programs Include:

- Astrophysics Research Program
- Cosmic Origins Program
- Physics of the Cosmos Program
- Exoplanet Exploration Program
- Astrophysics Explorer Program
- James Webb Space Telescope (Webb)

Outcomes:

- Further understanding of the universe and how it works, its history, as well as the continued search for life beyond our Solar System.

Strategic Objective 1.7: Transform NASA missions and advance the Nation's capabilities by maturing crosscutting and innovative space technologies.

Major Programs Include:

- Space Technology Research and Development
- Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR)

Outcomes:

- Develop new pioneering technologies, increasing the Nation's capability to perform space science, operate in space, and enable deep space exploration.
- Strengthen our Nation's leadership in space-related science, technology, and industrial base.
- Foster a technology-based U.S. economy.

Strategic Goals and Outcomes:
(continued)

Strategic Goal 2: Advance understanding of Earth and develop technologies to improve the quality of life on our home planet.

Strategic Objective 2.1: Enable a revolutionary transformation for safe and sustainable U.S. and global aviation by advancing aeronautics research.

Major Programs Include:

- Airspace Operations and Safety Program
- Advance Air Vehicles Program
- Integrated Aviation Systems Program
- Transformative Aeronautics Concepts Program

Outcomes:

- Enable a revolutionary transformation of the aviation system to improve our quality of life and productivity on Earth.

- Contribute unique innovations to aviation through research activities. These innovations serve as key enablers for the role of U.S. commercial aviation in sustaining American commerce and safe, environmentally sustainable mobility, and hence the Nation's economic well-being.

Strategic Objective 2.2: Advance knowledge of Earth as a system to meet the challenges of environmental change, and to improve life on our planet.

Major Programs Include:

- Earth Science Research Program
- Earth Systematic Missions Program
- Earth System Science Pathfinders Program
- Earth Science Multi-Mission Operations Program
- Applied Sciences Program
- Earth Science Technology Program

Outcomes:

- NASA's Earth science programs shape an interdisciplinary view of Earth, exploring the interaction among the atmosphere, oceans, ice sheets, land surface interior, and life itself, which enables scientists to measure global and climate changes and to inform decisions by Government, organizations, and people.

Strategic Objective 2.3: Optimize Agency technology investments, foster open innovation, and facilitate technology infusion, ensuring the greatest national benefit.

Major Programs Include:

- Agency Technology and Innovation

Outcomes:

- Optimization of NASA's technology portfolio

- Enabling of critical technology development and open innovation

- Maximized transfer of NASA technology to U.S. partners

Strategic Objective 2.4: Advance the Nation's Science, Technology, Engineering, and Math (STEM) education and workforce pipeline by working collaboratively with other agencies to engage students, teachers, and faculty in NASA's missions and unique assets.

Major Programs Include:

- Aerospace Research & Career Development Program
- STEM Education and Accountability Program

Outcomes:

- Federal agencies work together to improve the quality of science, technology, engineering, and math (STEM) education in the United States.

- NASA will increase impact on the Nation's STEM education and workforce pipeline through the extension of STEM-based internships, scholarships, and fellowships and the contribution of unique NASA mission and asset driven institution engagement, experiential learning, and professional development opportunities.

Strategic Goal 3: Serve the American public and accomplish our Mission by effectively managing our people, technical capabilities, and infrastructure.

Strategic Objective 3.1: Attract and advance a highly skilled, competent, and diverse workforce, cultivate an innovative work environment, and provide the facilities, tools, and services needed to conduct NASA's missions.

Major Programs Include:

- Center Management and Operations
- Agency Management
- Institutional Construction of Facilities (CoF)
- Environmental Compliance and Restoration
- Space Shuttle Program

Outcomes:

- Effective management of human capital, finance, information technology, infrastructure, acquisitions, security, real and personal property, occupational health and safety, equal employment opportunity and diversity, small business programs, external relations, internal and external communications, stakeholder engagement, and other essential corporate functions.

- Sustainable management of NASA's infrastructure.

- NASA will have a diverse workforce infused with the spirit of innovation.

Strategic Objective 3.2: Ensure the availability and continued advancement of strategic, technical, and programmatic capabilities to sustain NASA's Mission.

Major Programs Include:

- Space Communications and Navigation (SCaN)
- Launch Services Program (LSP)
- Rocket Propulsion Testing (RPT)
- Exploration Construction of Facilities
- Space Operations Construction of Facilities
- Strategic Capabilities Assets Program (SCAP)
- 21st Century Space Launch

Outcomes:

- Key capabilities and critical assets will be available to NASA and other entities in support of NASA's missions.

Strategic Objective 3.3: Provide secure, effective, and affordable information technologies and services that enable NASA's Mission.

Major Programs Include:

- Agency IT Services Program

Outcomes:

- IT enablement of NASA's mission and vision will be optimized.

- A seamless collaborative and mobile work environment that safeguards NASA's information assets will be created.

Strategic Objective 3.4: Ensure effective management of NASA programs and operations to complete the mission safely and successfully.

Major Programs Include:

- Office of the Chief Engineer (OCE)
- Office of Safety and Mission Assurance (OSMA)
- Office of the Chief Health and Medical Officer (OCHMO)

Outcomes:

- NASA will protect the health and safety of the NASA workforce.

- Safety and Mission Success will improve the likelihood that NASA's programs, projects, and operations are completed safely and successfully.

Required Supplementary Information

Combining Schedule of Budgetary Resources For the Fiscal Year Ended September 30, 2016

(In Millions of Dollars)	Space Operations	Science	Exploration	Aeronautics	Safety, Security and Mission Services	Education
Budgetary Resources:						
Unobligated Balance, Brought Forward, October 1	$ 220	$ 284	$ 60	$ 14	$ 258	$ 35
Recoveries of Prior Year Unpaid Obligations	43	43	42	13	45	3
Other Changes in Unobligated Balance	2	(8)	(19)	(3)	(10)	(1)
Unobligated Balance from Prior Year Budget Authority, Net	265	319	83	24	292	37
Appropriations	5,015	5,584	4,014	634	2,772	115
Spending Authority from Offsetting Collections	—	—	—	—	2,581	—
Total Budgetary Resources	**$ 5,280**	**$ 5,903**	**$ 4,097**	**$ 658**	**$ 5,646**	**$ 152**
Status of Budgetary Resources:						
New Obligations and Upward Adjustments (Total)	$ 5,122	$ 5,587	$ 4,048	$ 645	$ 5,336	$ 138
Unobligated Balance, End of Year:						
Apportioned, Unexpired Accounts	104	301	44	12	303	11
Unapportioned, Unexpired Accounts	—	—	—	—	—	—
Unexpired Unobligated Balance, End of Year	104	301	44	12	303	11
Expired Unobligated Balance, End of Year	54	15	5	1	7	3
Unobligated Balance, End of Year (Total)	158	316	49	13	310	14
Total Status of Budgetary Resources	**$ 5,280**	**$ 5,903**	**$ 4,097**	**$ 658**	**$ 5,646**	**$ 152**
Change in Obligated Balance:						
Unpaid Obligations:						
Unpaid Obligations, Brought Forward, October 1	$ 1,589	$ 3,253	$ 1,501	$ 322	$ 1,859	$ 159
New Obligations and Upward Adjustments (Total)	5,122	5,587	4,048	645	5,336	138
Outlays (Gross) (-)	(4,950)	(5,175)	(4,237)	(610)	(4,923)	(114)
Recoveries of Prior Year Unpaid Obligations (-)	(43)	(43)	(42)	(13)	(45)	(3)
Unpaid Obligations, End of Year	1,718	3,622	$ 1,270	344	$ 2,227	180
Uncollected payments:						
Uncollected Payments, Federal Sources, Brought Forward, October 1 (-)	—	—	—	—	(1105)	—
Change in Uncollected Payments, Federal Sources	—	—	—	—	(339)	—
Uncollected Payments, Federal Sources, End of Year (-)	—	—	—	—	(1,444)	—
Memorandum (Non-Add) Entries:						
Obligated Balance, Start of Year	**1,589**	**3,253**	**1,501**	**322**	**754**	**159**
Obligated Balance, End of Year	**$ 1,718**	**$ 3,622**	**$ 1,270**	**$ 344**	**$ 783**	**$ 180**
Budget Authority and Outlays, Net:						
Budget Authority, Gross	$ 5,015	$ 5,584	$ 4,014	$ 634	$ 5,353	$ 115
Actual Offsetting Collections (-)	(1)	(1)	(1)	—	(2,250)	—
Change in Uncollected Payments, Federal Sources	—	—	—	—	(339)	—
Recoveries of Prior Year Paid Obligations	1	1	1	—	8	—
Budget Authority, Net (Total)	**5,015**	**5,584**	**4,014**	**634**	**2,772**	**115**
Outlays, Gross	4,950	5,175	4,237	610	4,923	114
Actual Offsetting Collections (-)	(1)	(1)	(1)	—	(2,250)	—
Outlays, Net (Total)	4,949	5,174	4,236	610	2,673	114
Distributed Offsetting Receipts (-)	—	—	—	—	—	—
Agency Outlays, Net	**$ 4,949**	**$ 5,174**	**$ 4,236**	**$ 610**	**$ 2,673**	**$ 114**

Combining Schedule of Budgetary Resources For the Fiscal Year Ended September 30, 2016 (continued)

(In Millions of Dollars)	Office of Inspector General	American Recovery and Rein-vestment Act	Space Technology	Construction and Environmental Compliance and Restoration	Other	Total
Budgetary Resources:						
Unobligated Balance, Brought Forward, October 1	$ 2	$ —	$ 50	$ 162	$ 19	$ 1,104
Recoveries of Prior Year Unpaid Obligations	1	—	10	33	10	243
Other Changes in Unobligated Balance	—	—	4	19	—	(16)
Unobligated Balance from Prior Year Budget Authority, Net	3	—	64	214	29	1,331
Appropriations	37	—	687	427	1	19,286
Spending Authority from Offsetting Collections	1	—	—	6	414	3,002
Total Budgetary Resources	**$ 41**	**$ —**	**$ 751**	**$ 647**	**$ 444**	**$ 23,619**
Status of Budgetary Resources:						
New Obligations and Upward Adjustments (Total)	$ 39	$ —	$ 677	$ 513	$ 422	$ 22,527
Unobligated Balance, End of Year:						
Apportioned, Unexpired Accounts	—	—	70	134	15	994
Unapportioned, Unexpired Accounts	—	—	1	—	1	2
Unexpired Unobligated Balance, End of Year	—	—	71	134	16	996
Expired Unobligated Balance, End of Year	2	—	3	—	6	96
Unobligated Balance, End of Year (Total)	2	—	74	134	22	1,092
Total Status of Budgetary Resources	**$ 41**	**$ —**	**$ 751**	**$ 647**	**$ 444**	**$ 23,619**
Change in Obligated Balance:						
Unpaid Obligations:						
Unpaid Obligations, Brought Forward, October 1	$ 4	$ —	$ 378	$ 734	$ 170	$ 9,969
New Obligations and Upward Adjustments (Total)	39	—	677	513	422	22,527
Outlays (Gross) (-)	(38)	—	(560)	(495)	(406)	(21,508)
Recoveries of Prior Year Unpaid Obligations (-)	(1)	—	(10)	(33)	(10)	(243)
Unpaid Obligations, End of Year	4	—	485	719	176	10,745
Uncollected payments:						
Uncollected Payments, Federal Sources, Brought Forward, October 1 (-)	—	—	—	—	—	(1,105)
Change in Uncollected Payments, Federal Sources	—	—	—	—	—	(339)
Uncollected Payments, Federal Sources, End of Year (-)	—	—	—	—	—	(1,444)
Memorandum (Non-Add) Entries:						
Obligated Balance, Start of Year	**4**	**—**	**378**	**734**	**170**	**8,864**
Obligated Balance, End of Year	**$ 4**	**$ —**	**$ 485**	**$ 719**	**$ 176**	**$ 9,301**
Budget Authority and Outlays, Net:						
Budget Authority, Gross	$ 38	$ —	$ 687	$ 433	$ 415	$ 22,288
Actual Offsetting Collections (-)	(1)	—	—	(6)	(414)	(2,674)
Change in Uncollected Payments, Federal Sources	—	—	—	—	—	(339)
Recoveries of Prior Year Paid Obligations	—	—	—	—	—	11
Budget Authority, Net (Total)	**37**	**—**	**687**	**427**	**1**	**$ 19,286**
Outlays, Gross	38	—	560	495	$ 406	21,508
Actual Offsetting Collections (-)	(1)	—	—	(6)	(414)	(2,674)
Outlays, Net (Total)	37	—	560	489	(8)	18,834
Distributed Offsetting Receipts (-)	—	—	—	—	(5)	(5)
Agency Outlays, Net	**$ 37**	**$ —**	**$ 560**	**$ 489**	**$ (13)**	**$ 18,829**

Combining Schedule of Budgetary Resources For the Fiscal Year Ended September 30, 2015

(In Millions of Dollars)	Space Operations	Science	Exploration	Aeronautics	Safety, Security and Mission Services	Education
Budgetary Resources:						
Unobligated Balance, Brought Forward, October 1	$ 196	$ 303	$ 115	$ 23	$ 232	$ 30
Recoveries of Prior Year Unpaid Obligations	45	41	63	7	61	2
Other Changes in Unobligated Balance	1	(10)	(3)	(2)	(15)	(4)
Unobligated Balance from Prior Year Budget Authority, Net	242	334	175	28	278	28
Appropriations	3,822	5,243	4,367	642	2,759	119
Spending Authority from Offsetting Collections	—	—	—	—	2,372	—
Total Budgetary Resources	**$ 4,064**	**$ 5,577**	**$ 4,542**	**$ 670**	**$ 5,409**	**$ 147**
Status of Budgetary Resources:						
New Obligations and Upward Adjustments (Total)	$ 3,844	$ 5,293	$ 4,482	$ 656	$ 5,151	$ 112
Unobligated Balance, End of Year:						
Apportioned, Unexpired Accounts	169	273	58	12	247	33
Unapportioned, Unexpired Accounts	—	—	—	—	—	—
Unexpired Unobligated Balance, End of Year	169	273	58	12	247	33
Expired Unobligated Balance, End of Year	51	11	2	2	11	2
Unobligated Balance, End of Year (Total)	220	284	60	14	258	35
Total Status of Budgetary Resources	**$ 4,064**	**$ 5,577**	**$ 4,542**	**$ 670**	**$ 5,409**	**$ 147**
Change in Obligated Balance:						
Unpaid Obligations:						
Unpaid Obligations, Brought Forward, October 1	$ 1,490	$ 3,172	$ 1,919	$ 251	$ 1,821	$ 158
New Obligations and Upward Adjustments (Total)	3,844	5,293	4,482	656	5,151	112
Outlays (Gross) (-)	(3,700)	(5,172)	(4,837)	(578)	(5,052)	(109)
Recoveries of Prior Year Unpaid Obligations (-)	(45)	(41)	(63)	(7)	(61)	(2)
Unpaid Obligations, End of Year	1,589	3,252	1,501	322	1,859	159
Uncollected payments:						
Uncollected Payments, Federal Sources, Brought Forward, October 1 (-)	—	—	—	—	(988)	—
Change in Uncollected Payments, Federal Sources	—	—	—	—	(117)	—
Uncollected Payments, Federal Sources, End of Year (-)	—	—	—	—	(1,105)	—
Memorandum (Non-Add) Entries:						
Obligated Balance, Start of Year	**1,490**	**3,172**	**1,919**	**251**	**833**	**158**
Obligated Balance, End of Year	**$ 1,589**	**$ 3,252**	**$ 1,501**	**$ 322**	**$ 754**	**$ 159**
Budget Authority and Outlays, Net:						
Budget Authority, Gross	$ 3,822	$ 5,243	$ 4,367	$ 642	$ 5,131	$ 119
Actual Offsetting Collections (-)	(4)	(2)	(1)	—	(2,258)	—
Change in Uncollected Payments, Federal Sources	—	—	—	—	(117)	—
Recoveries of Prior Year Paid Obligations	4	2	1	—	3	—
Budget Authority, Net (Total)	**3,822**	**5,243**	**4,367**	**642**	**2,759**	**119**
Outlays, Gross	3,700	5,172	4,837	578	5,052	109
Actual Offsetting Collections (-)	(4)	(2)	(1)	—	(2,258)	—
Outlays, Net (Total)	3,696	5,170	4,836	578	2,794	109
Distributed Offsetting Receipts (-)	—	—	—	—	—	—
Agency Outlays, Net	**$ 3,696**	**$ 5,170**	**$ 4,836**	**$ 578**	**$ 2,794**	**$ 109**

Combining Schedule of Budgetary Resources For the Fiscal Year Ended September 30, 2015 (continued)

(In Millions of Dollars)	Office of Inspector General	American Recovery and Reinvestment Act	Space Technology	Construction and Environmental Compliance and Restoration	Other	Total
Budgetary Resources:						
Unobligated Balance, Brought Forward, October 1	$ 4	$ 3	$ 22	$ 203	$ 20	$ 1,151
Recoveries of Prior Year Unpaid Obligations	—	9	8	19	1	256
Other Changes in Unobligated Balance	(2)	(11)	—	4	1	(41)
Unobligated Balance from Prior Year Budget Authority, Net	2	1	30	226	22	1,366
Appropriations	37	—	596	427	1	18,013
Spending Authority from Offsetting Collections	1	—	—	4	419	2,796
Total Budgetary Resources	**$ 40**	**$ 1**	**$ 626**	**$ 657**	**$ 442**	**$ 22,175**
Status of Budgetary Resources:						
New Obligations and Upward Adjustments (Total)	$ 38	$ 1	$ 576	$ 495	$ 423	$ 21,071
Unobligated Balance, End of Year:						
Apportioned, Unexpired Accounts	—	—	49	162	13	1,016
Unapportioned, Unexpired Accounts	—	—	—	—	2	2
Unexpired Unobligated Balance, End of Year	—	—	49	162	15	1,018
Expired Unobligated Balance, End of Year	2	—	1	—	4	86
Unobligated Balance, End of Year (Total)	2	—	50	162	19	1,104
Total Status of Budgetary Resources	**$ 40**	**$ 1**	**$ 626**	**$ 657**	**$ 442**	**$ 22,175**
Change in Obligated Balance:						
Unpaid Obligations:						
Unpaid Obligations, Brought Forward, October 1	$ 4	$ 9	$ 344	$ 804	$ 152	$ 10,124
New Obligations and Upward Adjustments (Total)	38	1	576	495	423	21,071
Outlays (Gross) (-)	(38)	(1)	(535)	(545)	(403)	(20,970)
Recoveries of Prior Year Unpaid Obligations (-)	—	(9)	(7)	(19)	(2)	(256)
Unpaid Obligations, End of Year	4	—	378	735	170	9,969
Uncollected payments:						
Uncollected Payments, Federal Sources, Brought Forward, October 1 (-)	—	—	—	—	—	(988)
Change in Uncollected Payments, Federal Sources	—	—	—	—	—	(117)
Uncollected Payments, Federal Sources, End of Year (-)	—	—	—	—	—	(1,105)
Memorandum (Non-Add) Entries:						
Obligated Balance, Start of Year	**4**	**9**	**344**	**804**	**152**	**9,136**
Obligated Balance, End of Year	**$ 4**	**$ —**	**$ 378**	**$ 735**	**$ 170**	**$ 8,864**
Budget Authority and Outlays, Net:						
Budget Authority, Gross	$ 38	$ —	$ 596	$ 431	$ 420	$ 20,809
Actual Offsetting Collections (-)	(1)	—	—	(8)	(420)	(2,694)
Change in Uncollected Payments, Federal Sources	—	—	—	—	—	(117)
Recoveries of Prior Year Paid Obligations	—	—	—	4	1	15
Budget Authority, Net (Total)	**37**	**—**	**596**	**427**	**1**	**18,013**
Outlays, Gross	38	1	535	545	403	20,970
Actual Offsetting Collections (-)	(1)	—	—	(8)	(420)	(2,694)
Outlays, Net (Total)	37	1	535	537	(17)	18,276
Distributed Offsetting Receipts (-)	—	—	—	—	(4)	(4)
Agency Outlays, Net	**$ 37**	**$ 1**	**$ 535**	**$ 537**	**$ (21)**	**$ 18,272**

Deferred Maintenance and Repairs for FY 2016

Federal agencies are required to report information related to the estimated cost to remedy deferred maintenance of property, plant and equipment as required supplementary information in accordance with SFFAS No. 42, *Deferred Maintenance and Repairs.*

Maintenance and repairs (M&R) are activities directed toward keeping fixed assets in an acceptable condition. Activities include preventive maintenance; replacement of parts, systems, or components; and other activities needed to preserve or maintain the asset. M&R, as distinguished from capital improvements, excludes activities directed toward expanding the capacity of an asset or otherwise upgrading it to serve needs different from, or significantly greater than, its current use. Deferred maintenance and repairs (DM&R) are M&R activities that were not performed when they should have been or were scheduled to be and which, therefore, are put off or delayed for a future period. DM&R reporting enables the Government to be accountable to citizens for the proper administration and stewardship of its assets. Specifically, DM&R reporting assists users by providing an entity's realistic estimate of DM&R amounts and the effectiveness of asset maintenance practices the entities employ in fulfilling their missions.

Facilities, Buildings, and Other Structures

It is NASA's policy to ensure that NASA-owned and operated assets are properly aligned with the NASA mission and are safe, environmentally sound, affordable, the right type and size, and in acceptable operating condition. NASA's facilities and equipment are maintained in the most cost effective fashion to minimize risk to processes and products, protect the safety and health of personnel and the environment, protect and preserve capabilities and capital investments, provide quality work places for NASA employees, and enable the Agency's mission. Estimates reported herein include DM&R for all facilities on-site or off-site that are owned, leased, occupied, or used by NASA (NASA Programs or Contractors) including heritage assets without regard to capitalization thresholds or depreciation status. NASA does not assess DM&R on general land parcels.

Equipment

Pursuant to the cost/benefit considerations provided in SFFAS No. 6 and SFFAS No. 42, NASA has determined that it is not cost beneficial to report DM&R on personal property (capital equipment).

Defining and Implementing M&R Policies

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 estimated of DM&R 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, heating, ventilating and air conditioning systems (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.

Ranking and Prioritizing M&R Activities

NASA typically prioritizes the M&R activities for health, safety, life safety, fire detection and protection, and environmental requirements. NASA also prioritizes the M&R projects with an emphasis on mission critical facilities, followed by mission support, then Center support. The evaluation of the facility conditions by building type indicates that NASA continues to focus M&R activities on direct mission-related facilities and infrastructure.

Factors Considered in Determining Acceptable Condition Standards

NASA applies industry accepted codes and standards or equipment manufacturer's recommendations to all facilities-related work. The standard of condition depends on the intended use, the mission criticality, utilization, or health and safety aspects of that use.

Changes from Prior Year

As of September 30, 2016, $2.386 billion of DM&R was estimated to be required to return real property assets to an acceptable operating condition. This is an overall increase of $60 million from September 30, 2015. The increase in the DM&R estimate can be attributed to various reasons, including changes to high-value assets and continued deterioration of certain systems and facilities.

Deferred Maintenance and Repair Costs

(In Millions of Dollars)	2016	2015
Asset Category		
Real Property	$ 2,374	$ 2,320
Heritage Assets - Real Property	12	6
Total Deferred Maintenance and Repair Costs	**$ 2,386**	**$ 2,326**

NASA OFFICE OF INSPECTOR GENERAL

SUITE 8U37, 300 E ST SW
WASHINGTON, D.C. 20546-0001

November 15, 2016

TO: Charles F. Bolden, Jr.
Administrator

David P. Radzanowski
Chief Financial Officer

SUBJECT: *Audit of NASA's Fiscal Year 2016 Financial Statements* (Report No. IG-17-004; Assignment No. A-16-007-00)

Dear Administrator Bolden and Mr. Radzanowski,

The Office of Inspector General contracted with the independent public accounting firm CliftonLarsonAllen LLP (CLA) to audit NASA's fiscal year (FY) 2016 financial statements. CLA performed the audit in accordance with the Government Accountability Office's (GAO) *Government Auditing Standards* and the Office of Management and Budget's Bulletin No. 15-02, "Audit Requirements for Federal Financial Statements."

This audit resulted in an unmodified opinion on NASA's FY 2016 financial statements (see attached Enclosure). An unmodified opinion means the financial statements present fairly, in all material respects, the financial position and results of NASA's operations in conformity with U.S. generally accepted accounting principles.

CLA also reported on NASA's internal control and compliance with laws and regulations. For FY 2016, CLA identified a significant deficiency for the second year in a row related to information technology configuration management. CLA also reported a repeat noncompliance with the implementing guidance for the Single Audit Act, as amended (Uniform Guidance).

We monitored the progress of the audit, reviewed CLA's reports and related documentation, inquired of CLA's representatives, and ensured CLA 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 conclusions on

compliance with certain laws and regulations, including but not limited to the Federal Financial Management Improvement Act of 1996. Rather, CLA is responsible for the enclosed report and the conclusions expressed therein. That said, our review disclosed no instances where CLA did not comply in all material respects with GAO's *Government Auditing Standards.*

We appreciate the courtesies extended to our team during the audit. Please contact Jim Morrison, Assistant Inspector General for Audits, at 202-358-0378 or james.l.morrison@nasa.gov, if you have any questions about the enclosed report.

Sincerely,

Paul K. Martin
Inspector General

Enclosure – 1

CliftonLarsonAllen

CliftonLarsonAllen LLP

www.cliftonlarsonallen.com

INDEPENDENT AUDITORS' REPORT

Administrator
National Aeronautics and Space Administration

Inspector General
National Aeronautics and Space Administration

Report on the Financial Statements

We have audited the accompanying consolidated financial statements of the National Aeronautics and Space Administration (NASA), which comprise the consolidated balance sheets as of September 30, 2016 and 2015, and the related consolidated statements of net cost and changes in net position, and the combined statements of budgetary resources for the years then ended, and the related notes to the consolidated financial statements (collectively referred to as financial statements).

Management's Responsibility for the Financial Statements

NASA management is responsible for the preparation and fair presentation of these financial statements in accordance with accounting principles generally accepted in the United States of America (U.S.); 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.

Auditors' Responsibility

Our responsibility is to express an opinion on these financial statements based on our audits. We conducted our audits in accordance with auditing standards generally accepted in the U.S.; 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. 15-02*, Audit Requirements for Federal Financial Statements* (OMB Bulletin 15-02). Those standards and OMB Bulletin 15-02 require that we plan and perform the audits 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 the auditors' judgment, including the assessment of the risk of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers 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.

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INDEPENDENT AUDITORS' REPORT (Continued)

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion on the Financial Statements

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the National Aeronautics and Space Administration as of September 30, 2016 and 2015 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 U.S.

Other Matters

Required Supplementary Information
Accounting principles generally accepted in the U.S. require that the information in NASA's Management Discussion and Analysis (MD&A), Required Supplementary Information (RSI), and Required Supplementary Stewardship Information (RSSI) sections on pages 3 through 47 and 76 through 87, be presented to supplement the financial statements. Such information, although not a part of the financial statements, is required by the Federal Accounting Standards Advisory Board, who considers it to be an essential part of financial reporting for placing the financial statements in an 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 U.S., 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 financial statements, and other knowledge we obtained during our audits of the financial statements. We do not express an opinion or provide any assurance on this information because the limited procedures do not provide us with sufficient evidence to express an opinion or provide any assurance.

Other Information
Our audits were conducted for the purpose of forming an opinion on the financial statements as a whole. All other sections referred to in the Agency Financial Report (AFR) table of contents, exclusive of the MD&A; Financial Statements, Notes, and Supplemental Information; and Independent Auditors' Report, are presented for purposes of additional analysis and are not a required part of the financial statements. In addition, management has included references to information on websites or other data outside of the AFR. This information has not been subjected to the auditing procedures applied in the audits of the financial statements, and accordingly, we do not express an opinion or provide any assurance on it.

INDEPENDENT AUDITORS' REPORT (Continued)

Report on Internal Control over Financial Reporting and on Compliance and Other Matters Based on an Audit of Financial Statements Performed in Accordance with *Government Auditing Standards*

Report on Internal Control over Financial Reporting

In planning and performing our audit of the consolidated financial statements as of and for the year ended September 30, 2016, 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.

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 NASA's financial statements will not be prevented, or detected and corrected on a timely basis. A *significant deficiency* is a deficiency, or 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 and therefore, material weaknesses or significant deficiencies may exist that were not identified. Given these limitations, during our audit we did not identify any deficiencies in internal control that we consider to be material weaknesses. However, we did identify a certain deficiency in internal control that we consider to be a significant deficiency. This deficiency is listed below and described in **Exhibit A**:

- Information Technology Configuration Management

Report on Compliance with Laws, Regulations, Contracts, and Grant Agreements 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, regulations, contracts, and grant agreements, noncompliance with which could have a direct effect on the determination of material financial statement amounts and disclosures. 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 disclosed one instance of noncompliance that is required to be reported in accordance with *Government Auditing Standards* or OMB Bulletin 15-02. This noncompliance matter is listed below and described in **Exhibit B**:

- Noncompliance with Certain Provisions of Title 2 of the Code of Federal Regulations, *Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards*

INDEPENDENT AUDITORS' REPORT (Continued)

We also performed tests of compliance with certain provisions of the Federal Financial Management Improvement Act of 1996 (FFMIA). However, providing an opinion on compliance with FFMIA was not an objective of our audit, and accordingly, we do not express such an opinion. The results of our tests of these provisions disclosed no instances in which NASA's financial management systems did not comply substantially with (1) Federal financial management systems requirements, (2) applicable Federal accounting standards, or (3) the United States Standard General Ledger (USSGL) at the transaction level.

Management's Responsibility for Internal Control and Compliance

Management is responsible for (1) evaluating the effectiveness of internal control over financial reporting based on criteria established under the Federal Managers' Financial Integrity Act of 1982 (FMFIA), (2) providing a statement of assurance on the overall effectiveness on internal control over financial reporting, (3) ensuring NASA's financial management systems comply substantially with FFMIA requirements, and (4) complying with other applicable laws, regulations, contracts, and grant agreements.

Auditors' Responsibilities

We are responsible for: (1) obtaining a sufficient understanding of internal control over financial reporting to plan the audit, (2) testing whether NASA's financial management systems comply substantially with the FFMIA requirements referred to above, and (3) testing compliance with certain provisions of laws, regulations, contracts, and grant agreements.

We did not evaluate all internal controls relevant to operating objectives as broadly established by the FMFIA, such as those controls relevant to preparing statistical reports and ensuring efficient operations. We limited our internal control testing to testing controls over financial reporting. Because of inherent limitations in internal control, misstatements due to error or fraud, losses, or noncompliance may nevertheless occur and not be detected. We also caution that projecting our audit results to future periods is subject to risk that controls may become inadequate because of changes in conditions or that the degree of compliance with controls may deteriorate. In addition, we caution that our internal control testing may not be sufficient for other purposes.

We did not test compliance with all laws, regulations, contracts, and grant agreements applicable to NASA. We limited our tests to certain provisions of laws, regulations, contracts, and grant agreements noncompliance with which could have a direct effect on the determination of material financial statement amounts and disclosures. 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. We caution that noncompliance may occur and not be detected by these tests and that such testing may not be sufficient for other purposes. Also, our work on FFMIA would not necessarily disclose all instances of noncompliance with FFMIA requirements.

Management's Response to Findings

Management's response to the findings identified in our report is presented in **Exhibit C**. We did not audit NASA's response and, accordingly, we express no opinion on it.

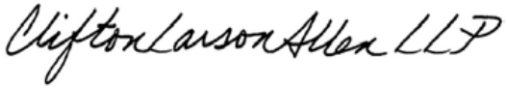
INDEPENDENT AUDITORS' REPORT (Continued)

Status of Prior Year's Control Deficiencies and Noncompliance Issue

We have reviewed the status of NASA's corrective actions with respect to the findings included in the prior year's Independent Auditors' Report, dated November 13, 2015. The status of prior year findings is presented in **Exhibit D**.

Purpose of the Report on Internal Control over Financial Reporting and the Report on Compliance with Laws, Regulations, Contracts, and Grant Agreements and Other Matters

The purpose of the Report on Internal Control over Financial Reporting and the Report on Compliance with Laws, Regulations, Contracts, and Grant Agreements and Other Matters sections of this report is solely to describe the scope of our testing of internal control and compliance and the results of that testing, and not to provide an opinion on the effectiveness of NASA's internal control or on compliance. These reports are an integral part of an audit performed in accordance with *Government Auditing Standards* in considering NASA's internal control and compliance. Accordingly, these reports are not suitable for any other purpose.



CliftonLarsonAllen LLP

Calverton, Maryland
November 15, 2016

INDEPENDENT AUDITORS' REPORT (Continued)
EXHIBIT A
Significant Deficiency
September 30, 2016

Information Technology Configuration Management

Background

The United States Government Accountability Office (GAO) has stated that protecting government computer systems has never been more important because of the complexity and interconnectivity of systems (including those exposed to the Internet and wireless connections), the ease of obtaining and using hacking tools, the steady advances in the sophistication and effectiveness of attack technologies, and the emergence of new and more destructive attacks. Further, the boundary lines between internal and external networks are diminishing as a result of increased interconnectivity. GAO cited challenges, such as maintaining software with the current versions and latest security patches to protect against known vulnerabilities, as contributing factors to weaknesses within Federal agency security programs.

To address these issues throughout the government, the Office of Management and Budget (OMB) revised OMB Circular No. A-130, *Managing Federal Information as a Strategic Resource* (OMB Circular A-130). This circular defines agencies' responsibilities for protecting Federal information resources. NASA relies extensively on Information Technology (IT) system controls to govern the initiation and authorization of financial transactions at user workstations, and transmit those transactions across the network to servers that record, process, summarize, and report financial transactions that support its financial statements. Internal controls over these financial and supporting operations are essential to ensure the confidentiality, integrity, and availability (CIA) of critical data while reducing the risk of error, fraud, and other illegal acts.

Configuration Management Conditions

Configuration management controls are intended to provide reasonable assurance that systems, networks, and applications are configured and operating securely. Vulnerability management, an important component of configuration management, specifically addresses mitigating the risks associated with known vulnerabilities.

In the current fiscal year, NASA did not substantially address deficiencies in its vulnerability management program identified in the prior year. Contrary to specific requirements of NASA's policy and procedures, the vulnerability management program continued to inadequately address monitoring, detecting, and timely remediation of vulnerabilities associated with their financial application and general support systems. Further, IT general and application controls insufficiently mitigated the risk to the CIA of critical data relevant to NASA's financial environment.

NASA relied on their defense in depth (DiD) approach, the intent of which was to implement controls at each layer of their IT environment, in order to comprehensively address security risks from vulnerabilities. While we found that NASA had implemented certain defensive technologies and processes to protect the CIA of NASA's data, we noted deficiencies in NASA's DiD approach with respect to the associated key controls.

As in the prior year, we found that NASA did not have an effective process for vulnerability management, the goal of which is to reduce the risk of incurring a breach and decrease the time and effort necessary to appropriately respond thereafter. Specifically, a substantial number of critical and high severity vulnerabilities (as well as medium and low vulnerabilities) remained outstanding for an excessive length of time contrary to NASA policy and procedures. These

INDEPENDENT AUDITORS' REPORT (Continued)
EXHIBIT A
Significant Deficiency
September 30, 2016

weaknesses expose NASA to significant risk of exploitation. Below are the categories of control deficiencies related to NASA's vulnerability management program.

1. **Patch Management** – Systems, applications, and networks supporting financial applications were not patched in accordance with NASA guidelines to mitigate information security vulnerabilities. Patching is usually the most effective way to mitigate security flaws in software, and is often the only fully effective solution. Failure to apply patches timely increases the risk that known vulnerabilities will be exploited.

2. **Configuration Weaknesses and Default Passwords** – Operating systems and applications were poorly configured, including systems with default passwords, which placed key financial systems at unnecessary risk of unauthorized access and manipulation. Default settings are publicly available on the Internet and are well known by attackers. These settings can be exploited to allow them to gain unauthorized access that can compromise the CIA of sensitive information. Failure to change weak security configurations, including default password settings, could result in successful attacks on NASA's financial and supporting systems.

3. **Unsupported Software** – Unsupported systems and programs, that were no longer fully maintained by the software vendors, for an extended period of time continued to expose NASA to vulnerabilities that cannot be sufficiently mitigated.

Management presented mitigating DiD controls that included general and application controls. However, we noted deficiencies in the following mitigating controls related to the financial system, which failed to sufficiently reduce the risk associated with deficiencies in NASA's vulnerability management program. Specifically:

1. **Segregation of Duties (SoD)** – NASA's SoD management tool was not appropriately configured to comprehensively prevent or detect SoD conflicts.

2. **User Administration and Least Privilege** – We noted several users that had excessive privileges to powerful user administration functions within the financial system (e.g., create users, assign roles or profiles to users, and delete users).

3. **Audit Logging and Monitoring** – NASA did not have effective audit logging and monitoring controls over the financial system that would adequately identify and address suspicious and harmful activity.

NASA did not follow internal and Federal standards in implementing configuration management controls in its operations as noted by the following standards:

NASA Information Technology Security Handbook, *Security Categorization, Risk Assessment, Vulnerability Scanning, Expedited Patching, & Organizationally Defined Values* (ITS-HBK 2810.04-01A). This NASA policy requires that management "[m]itigate expedited patches within seven business days, non-expedited patches within 30 days, mitigate high and medium vulnerabilities from monthly scans within 30 days of scan date; mitigate high and medium vulnerabilities from quarterly scans within 90 days from scan date; mitigate low vulnerabilities from monthly and quarterly scans within 180 days from scan date."

INDEPENDENT AUDITORS' REPORT (Continued)
EXHIBIT A
Significant Deficiency
September 30, 2016

OMB Circular A-130, Appendix I, establishes minimum requirements for Federal information programs and assigns Federal agency responsibilities for the security of information and information systems. The Circular specifically prohibits agencies from the use of unsupported information systems and system components, and requires agencies to ensure that systems and components that cannot be appropriately protected or secured are given a high priority for upgrade or replacement. In addition, the Circular requires agencies to implement and maintain current updates and patches for all software and firmware components of information systems.

The National Institute of Standards and Technology (NIST) Special Publication (SP) 800-53, *Security and Privacy Controls for Federal Information Systems and Organizations*, Revision 4, security control: SI-2 Flaw Remediation, states that an organization must "[i]identify information systems affected by announced software flaws, including potential vulnerabilities resulting from those flaws, and report this information to designated organizational personnel with information security responsibilities. Security-relevant software updates include, for example, patches, service packs, hot fixes, and anti-virus signatures."

NIST SP 800-40, *Guide to Enterprise Patch Management Technologies*, Revision 3, states, "[p]atches are usually the most effective way to mitigate software flaw vulnerabilities, and are often the only fully effective solution. Sometimes there are alternatives to patches, such as temporary workarounds involving software or security control reconfiguration, but these workarounds often negatively impact functionality."

In addition, NIST SP 800-18, *Guide for Developing Security Plans for Federal Information Systems,* Revision 1, states, "[c]ompensating security controls are the management, operational, or technical controls employed by an agency in lieu of prescribed controls in the low, moderate, or high security control baselines, which provide equivalent or comparable protection for an information system. Compensating security controls for an information system will be employed by an agency only under the following conditions:

1. the agency selects the compensating controls from the security control catalog in NIST SP 800-53;
2. the agency provides a complete and convincing rationale and justification for how the compensating controls provide an equivalent security capability or level of protection for the information system; and
3. the agency assesses and formally accepts the risk associated with employing the compensating controls in the information system. The use of compensating security controls must be reviewed, documented in the system security plan, and approved by the authorizing official for the information system."

Absent an effectively implemented and enforced configuration management program that addresses significant security weaknesses, there is an increased risk that financial information may be inadvertently or deliberately disclosed, manipulated, or misappropriated. Additionally, inappropriate or unnecessary changes may be made to key financial information systems, which could result in the compromise of financial information.

We have provided NASA's management with a separate limited distribution report that further details the vulnerabilities in NASA's systems. Due to the sensitivity of the matters noted, we have not discussed those matters in this report.

INDEPENDENT AUDITORS' REPORT (Continued)
EXHIBIT A
Significant Deficiency
September 30, 2016

Recommendations:
We recommend that NASA enhance their efforts to analyze and prioritize remediation to address security and control deficiencies with a focus on these key tasks that include, but are not limited to:

1. Implement improved processes to continuously identify and remediate security deficiencies on the financial application and general support systems.
2. Implement an improved patch and vulnerability management program to address security deficiencies.
3. Implement an effective process to eliminate configuration weaknesses which allow unauthorized access to sensitive system resources and files.
4. Develop and implement a strategic plan to address outdated technologies that are no longer supported by the vendor.
5. Implement improved deployment processes to eliminate vendor default passwords and weak configurations at the time of installation.
6. Remediate and enhance mitigating controls (IT general, application and technical) within NASA's IT environment.

INDEPENDENT AUDITORS' REPORT (Continued)
EXHIBIT B
Noncompliance with Laws and Regulations
September 30, 2016

Noncompliance with Certain Provisions of Title 2 of the Code of Federal Regulations, *Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards*

Based on the evidence gathered during our audit, we determined that NASA is not fully compliant with the following provisions of Title 2 of the Code of Federal Regulations (CFR) – *Uniform Administrative Requirement, Cost Principles, and Audit Requirements for Federal Awards*, (the Uniform Guidance):

- Subpart F, *Audit Requirements*, § 200.513, *Responsibilities*
  "(c) Federal awarding agency responsibilities. The Federal awarding agency must perform the following for the Federal awards it makes…
  (1) Ensure that audits are completed and reports are received in a timely manner and in accordance with the requirements of this Part…
  (3) Follow-up on audit findings to ensure that the recipient takes appropriate and timely corrective action. As part of audit follow-up, the Federal awarding agency must:
  (i) Issue a management decision as prescribed in § 200.521 *Management Decision*;
  (ii) Monitor the recipient taking appropriate and timely corrective action;
  (iii) Use cooperative audit resolution mechanisms (see § 200.25 *Cooperative audit resolution*) to improve Federal program outcomes through better audit resolution, follow-up, and corrective action; and
  (iv) Develop a baseline, metrics, and targets to track, over time, the effectiveness of the Federal agency's process to follow-up on audit findings and on the effectiveness of Single Audits in improving non-Federal entity accountability and their use by Federal awarding agencies in making award decisions.
  (4) Provide OMB [Office of Management and Budget] annual updates to the compliance supplement and work with OMB to ensure that the compliance supplement focuses the auditor to test the compliance requirements most likely to cause improper payments, fraud, waste, abuse or generate audit finding for which the Federal awarding agency will take sanctions."
- Subpart F, *Audit Requirements*, § 200.521, *Management Decision*
  "(a) General. The management decision must clearly state whether or not the audit finding is sustained, the reasons for the decision, and the expected auditee action to repay disallowed costs, make financial adjustments, or take other action. If the auditee has not completed corrective action, a timetable for follow-up should be given. Prior to issuing the management decision, the Federal agency or pass-through entity may request additional information or documentation from the auditee, including a request for auditor assurance related to the documentation, as a way of mitigating disallowed costs. The management decision should describe any appeal process available to the auditee…
  (b) Federal agency…[T]he cognizant agency for audit must be responsible for coordinating a management decision for audit findings that affect the programs of more than one Federal agency…[A] Federal awarding agency is responsible for issuing a management decision for findings that relate to Federal awards it makes to non-Federal entities…

INDEPENDENT AUDITORS' REPORT (Continued)
EXHIBIT B
Noncompliance with Laws and Regulations
September 30, 2016

> (d) Time requirements. The Federal awarding agency or pass-through entity responsible for issuing a management decision must do so within six months of acceptance of the audit report by the FAC [Federal Audit Clearinghouse]. The auditee must initiate and proceed with corrective action as rapidly as possible and corrective action should begin no later than upon receipt of the audit report…"

We based this determination on the following findings:

Monitoring of the Grantees' Single Audits during the Post-Award Stage
NASA lacks processes and procedures to determine (1) which of its grant recipients are required, based on spending thresholds, to have audits conducted in accordance with the Single Audit Act, (2) if the recipients that require such audits have completed the audits, and (3) if the resulting audit report was submitted to the FAC in a timely manner.

We found no evidence that NASA personnel determined that all its grantees that met the requirements (i.e., spent a minimum of $750,000 of NASA's funds annually for fiscal years beginning after December 26, 2014, and $500,000 annually in prior fiscal years) had single audits performed pursuant to the requirements in the Uniform Guidance and, accordingly, submitted such audit reports to the FAC in a timely manner. NASA's efforts to address last year's recommendations to annually determine which grantees should be obtaining a single audit, and implement a system to monitor the timely receipt and review of the required audits are still ongoing. Accordingly, follow-up action on single audit findings and questioned costs, including issuance of management decisions, was only performed on those grantees for which FAC reported findings on NASA's direct awards as identified by the Agency's Office of Inspector General (OIG).

Further, we found no evidence that NASA provided OMB with updates to the compliance supplement and worked with OMB to ensure that the compliance supplement focuses the auditor to test the compliance requirements most likely to cause improper payments, fraud, waste, abuse or generate audit findings for which NASA will take sanctions.

This situation arises because NASA lacks grant policies and procedures and existing practices are not properly designed to achieve compliance with all facets of the Uniform Guidance. NASA management communicated that developing policies and procedures that are fully compliant with the Uniform Guidance requires a significant level of effort, resources, and financial investment, so they are still being developed. The corrective actions are expected to be completed in fiscal year 2018.

As such, during the current year, NASA continued to rely on procedures that were designed and executed by the OIG in prior years to fulfil its responsibilities for following up on audit findings and their resolution. However, the OIG's procedures did not encompass all of the Agency's responsibilities. During the second quarter, NASA management started working with the OIG to compile the FAC reported findings on NASA's direct awards and this function is expected to be fully transitioned to NASA management in fiscal year 2017.

INDEPENDENT AUDITORS' REPORT (Continued)
EXHIBIT B
Noncompliance with Laws and Regulations
September 30, 2016

Because NASA is not fully compliant with the Uniform Guidance requirements in Subpart F, *Audit Requirements*, § 200.513, *Responsibilities*, during the post-award stage, NASA's resources may be at risk due to the following:

- Awardees may not be obtaining the required single audit or NASA's programs may not be subject to the single audit performed.
- Single audits may not be completed in a timely manner, which delays the post-award monitoring and oversight conducted for those awards, including implementation of the corrective actions that address internal controls deficiencies that were identified in the audit and recovery of questioned costs. Without timely follow-up, awardee internal control weaknesses may continue and result in other unallowable costs. Further, all delays reduce NASA's chances for recovering questioned costs, due to statutory deadlines or grantee dissolution.
- NASA may also continue to award grants to those awardees that are not complying with the Single Audit Act, or those awardees who have had single audits but have not resolved deficiencies noted in such single audit reports. This situation continues to place NASA's funds at risk.

Untimely Issuance of Management Decisions
NASA did not consistently issue management decisions on audit findings related to grant recipients of Federal awards within six months of acceptance of the grantee's single audit report by the FAC. During our review of the listing *Single Audit Reports with Open Findings and Questioned Costs through 7/31/2016*, we noted several grantees for which a management decision letter had not yet been sent, although NASA had been aware of the findings for over six months after the single audit report was accepted by the FAC. In addition, we noted seven grantees on the listing with 17 findings and questioned costs that date back more than two years from the FAC acceptance date, for which management decisions had not been issued. According to management, issuance of the decision letter was withheld because the grantees had not completed the corrective action. However, we determined that this is not the intended use of the management decision letter.

NASA management stated that it has been NASA's practice to issue management decision letters after all corrective actions have been completed. This process was chosen because management believed it offered greater efficiency in work flow and tracking, while normally allowing NASA to meet the six month deadline. NASA is in the process of reevaluating the timing of the issuance of management decisions in an effort to ensure compliance with the Uniform Guidance.

When NASA's process is tied to the completion of the corrective actions, NASA can easily lose sight of the six month deadline, thus risking noncompliance. Finally, two year delays in issuing management decision letters, with limited follow up, may allow the awardee to consider the findings as not warranting further action based on the Uniform Guidance requirements in Subpart F § 200.511, *Audit findings follow-up.* Without timely follow-up, awardee internal control weaknesses may continue and result in unallowable costs. Further, NASA's ability to recover questioned costs diminishes.

INDEPENDENT AUDITORS' REPORT (Continued)
EXHIBIT B
Noncompliance with Laws and Regulations
September 30, 2016

Inadequate Content of Management Decision Letters
The Uniform Guidance defines a management decision as "the evaluation by the Federal awarding agency of the audit findings and corrective action plan and the issuance of a written decision to the auditee as to what corrective action is necessary". The letters we reviewed did not contain the required elements stipulated in the Uniform Guidance. The management decision letters appeared to be form letters that lacked the (1) conclusion on whether the audit finding is sustained; (2) reasons for the management decisions; (3) expected auditee action to repay disallowed costs, make financial adjustments, or take other actions; and (4) timetable for corrective actions and follow-up. We determined that NASA is not using the management decision letters as intended by the Uniform Guidance.

If communications with grantees are not formalized in the management decision letter, but occur through informal communication (e.g., electronic mail and telephone) over an extended period of time:

- Grantees may not receive adequate and timely guidance and/or feedback from NASA on the expectation to repay disallowed costs, make financial adjustments or take other actions.
- Grantee corrective action plans may lack the necessary detail, may not be directly responsive to the finding, or may include procedures that would not adequately address the findings. NASA's ability to recover questioned costs and avoid repeat findings on its grants diminishes.

Recommendations:
We recommend that NASA's management take appropriate steps to comply with the requirements of the Uniform Guidance, 2 CFR § 200.513, *Responsibilities*, and § 200.521, *Management Decision*, and to require that NASA management perform the required regulatory oversight of its grants programs during the post-award stage to include:

1. Annually determine which grantees should be obtaining a single audit, and implement a system to monitor the timely receipt and review of the required audits.
2. Provide timely feedback to grantees and their auditors regarding issues with the single audit report or FAC reporting.
3. Evaluate annually whether a compliance supplement should be developed and submitted to OMB to provide guidance to auditors regarding specific NASA compliance requirements where noncompliance may have a direct and material effect on NASA's programs. After a compliance supplement has been submitted to OMB, then provide OMB annual updates to the compliance supplement and work with OMB to ensure that the compliance supplement focuses the auditor to test the compliance requirements most likely to cause improper payments, fraud, waste, abuse or generate audit findings for which NASA will take sanctions.
4. Develop/update policies and procedures to reflect the procedures implemented related to the monitoring of single audit reports of grantees receiving NASA funds.
5. Use the management decision letter for the intended purpose stated in § 200.521(a) *General.*
6. Revise the existing process so that management decisions are issued within six months of acceptance of the audit report by the FAC, regardless of the status of completion of the grantee's corrective actions, in accordance with § 200.521(d), *Time Requirements*.

INDEPENDENT AUDITORS' REPORT (Continued)
EXHIBIT B
Noncompliance with Laws and Regulations
September 30, 2016

7. Issue management decision letters stating whether or not an audit finding is sustained, the reasons for the decision, and the expected auditee action to repay disallowed costs, make financial adjustments, or take other corrective actions.

INDEPENDENT AUDITORS' REPORT (Continued)
EXHIBIT C
Management's Response to Findings
September 30, 2016

National Aeronautics and Space Administration

Headquarters
Washington, DC 20546-0001

November 15, 2016

Reply to Attn of:
Office of the Chief Financial Officer

TO: Inspector General

FROM: Chief Financial Officer

SUBJECT: Management Response to Report of Independent Auditors

I am pleased to accept your audit report on the Consolidated Financial Statements of the National Aeronautics and Space Administration (NASA) for FY 2015 and FY 2016. The Agency's efforts and achievements toward improved financial management are clearly reflected in the audit opinion. For the sixth year in a row, NASA has received an unmodified "clean" opinion on its financial statements with no reported material weaknesses. Further, NASA continues to be in substantial compliance with the Federal Financial Management Improvement Act.

NASA's independent auditors (CliftonLarsonAllen (CLA)) reported one significant deficiency related to Information Technology (IT) Configuration Management. NASA's response to this deficiency is provided below. The auditors also reported a non-compliance with certain provisions of Title 2 of the Code of Federal Regulations, *Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards*. NASA has already implemented actions to remediate this finding.

Information Technology Configuration Management

The annual financial statement audit has provided NASA with additional insight to areas where enhancement in protecting the confidentiality, integrity, and availability of financial data is warranted. NASA acknowledges that CLA identified opportunities for improvement within Marshall Space Flight Center's (MSFC's) overall vulnerability management program. NASA takes these findings seriously and immediately addressed a substantial portion of the findings cited in 2016. It should be noted that NASA management was proactive in establishing a more stringent and consistent process for documenting, reviewing and approving decisions to accept risk and close corrective action plans, to include proof of remediation.

In addition, MSFC continues to make changes in our vulnerability management program including:

- Increased management visibility of security risks.
- Prioritization of operating system and application patches.

INDEPENDENT AUDITORS' REPORT (Continued)
EXHIBIT C
Management's Response to Findings
September 30, 2016

- Chartered an independent review of the MSFC IT Security office to identify opportunities for improvement in our vulnerability management program. The recommendations will be implemented in FY17.
- Strengthened our assessment tool suite and scanning criteria.
- Augmented staff to aggressively focus on the aging vulnerabilities, to provide analysis and to work with system owners to reduce risk.

Finally, CLA's review identified potential opportunities to strengthen NASA's defense in depth controls some of which we have addressed and the remainder we are taking into consideration.

I appreciate the efforts and leadership of NASA's OIG and of the auditors throughout the audit of NASA's financial statements and related internal controls over financial reporting. Please convey my sincere appreciation and thanks to your team for the professionalism and cooperation exhibited during this audit.

David P. Radzanowski
Chief Financial Officer

Concur:

Renee Wynn
Chief Information Officer

INDEPENDENT AUDITORS' REPORT (Continued)
EXHIBIT D
Status of Prior Year's Control Deficiencies and Noncompliance Issue
September 30, 2016

Our assessment of the current status of the prior year control deficiencies and noncompliance issue is presented below:

Fiscal Year 2015 Finding	Fiscal Year 2016 Status
Significant Deficiency 1- Accounting and Reporting for Asbestos-Related Cleanup Costs: In 2015, NASA did not make any substantial attempts to develop a process to gather the information necessary to be able to implement the full intended breadth of the requirements in order to record an estimate of the anticipated future costs of the removal and disposal of asbestos containing material at various NASA properties. At September 30, 2015, NASA's reported liability of $22 million was substantially the same amount as that recorded in prior years.	NASA implemented a new methodology, which estimates asbestos abatement costs using a cost model for a group of similar real properties that are measured in square feet, and information from RS Means, an established cost estimation tool in the industry. With the implementation of the new methodology, which recognized an additional $106 million in asbestos abatement costs, the prior year significant deficiency is largely addressed. There is still a remaining issue, as the new methodology does not include procedures to estimate the liability associated with site preparation and transportation and disposal costs, which are necessary for the complete quantification of the asbestos-related cleanup costs. Our environmental engineers estimate these costs to be $54.8 million. However, we do not consider this remaining issue to be of the magnitude of a significant deficiency. As such, we consider the prior year Significant Deficiency 1 to be closed and will report the remaining finding as a deficiency in internal control in the management letter.
Significant Deficiency 2 – Information Technology Configuration Management NASA did not have an effective vulnerability management process relating to monitoring, detecting, and remediating known vulnerabilities. Specifically, we noted deficiencies in the following areas: A) Patch Management, B) Configuration Management and Default Passwords, and C) Software Support.	NASA did not substantially address deficiencies in its vulnerability management program, which continued to inadequately address monitoring, detecting, and timely remediation of vulnerabilities associated with their financial application and general support systems. Therefore, the prior year Significant Deficiency 2 remains open.
Noncompliance with Laws and Regulations – Noncompliance with the Single Audit Act (amended 1996) and Title 2 of the Code of Federal Regulations, *Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards (Uniform Guidance)* NASA management had not taken	NASA's corrective actions on noncompliance with the Uniform Guidance are ongoing and are not expected to be fully completed until fiscal year 2018. During the current year audit we also identified findings related to the form, content, and timing of NASA's management decisions. As such, we updated the prior year finding and continue to report it as noncompliance with laws and regulations.

INDEPENDENT AUDITORS' REPORT (Continued)
EXHIBIT D
Status of Prior Year's Control Deficiencies and Noncompliance Issue
September 30, 2016

adequate steps to ensure that the responsibilities set forth under the Single Audit Act (amended 1996) and the Uniform Guidance were assigned within NASA's organizational structure, and are being acted upon in a timely manner. Specifically, policies and procedures were not properly designed to achieve compliance with all facets of the Single Audit Act and had not been subsequently updated to comply with the newly issued Uniform Guidance.	

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Section 3

Other Information

Stargazing From the International Space Station. Astronauts aboard the International Space Station (ISS) see the world at night on every orbit — that's 16 times each crew day. An astronaut took this broad, short-lens photograph of Earth's night lights while looking out over the remote reaches of the central equatorial Pacific Ocean. **Photo credit:** NASA

NASA OFFICE OF INSPECTOR GENERAL

SUITE 8U37, 300 E ST SW
WASHINGTON, D.C. 20546-0001

November 15, 2016

TO: Charles F. Bolden, Jr.
Administrator

SUBJECT: *2016 Report on NASA's Top Management and Performance Challenges*

Dear Administrator Bolden,

As required by the Reports Consolidation Act of 2000, this annual report provides our views of the top management and performance challenges facing NASA for inclusion in the 2016 Agency Financial Report. We previously provided a draft copy of this document to NASA officials and considered all comments received when finalizing our report.

Similar to past years, in deciding whether to identify an issue as a top challenge we considered its significance in relation to NASA'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. Not surprisingly, given the importance and scope of the issues, this year's list includes many of the same challenges discussed in previous reports.

In addition to addressing these ongoing issues, the year ahead also includes the challenge of preparing for a leadership transition following the presidential election. As history has shown, changes in administrations can lead to great uncertainty about Agency programs, which can be particularly challenging for an agency like NASA that must plan its projects and missions years in advance. Abrupt changes in direction such as the 2009 cancellation of the previous Administration's human spaceflight program resulted in significant challenges for management while decision makers crafted compromise exploration plans.

Consequently, the challenge for NASA during the forthcoming transition will be to move forward on its ongoing projects and missions while retaining the flexibility to adapt to changes in direction from new leadership.

Looking to 2017, we identified the following as the top management and performance challenges facing NASA:

- Positioning NASA for Deep Space Exploration
- Managing the International Space Station and the Commercial Cargo and Crew Programs
- Managing NASA's Science Portfolio
- Overhauling NASA's Information Technology Governance
- Securing NASA's Information Technology Systems and Data
- Addressing NASA's Aging Infrastructure and Facilities
- Ensuring the Integrity of the Contracting and Grants Processes
- Ensuring the Continued Efficacy of the Space Communications Networks

During the coming year, the Office of Inspector General plans to conduct audits and investigations that focus on NASA's continuing efforts to meet these and other challenges.

Sincerely,

Paul K. Martin
Inspector General

cc: Dava Newman
Deputy Administrator

Robert Lightfoot
Associate Administrator

Lesa Roe
Deputy Associate Administrator

Michael French
Chief of Staff

Enclosure – 1

NASA's Top Management and Performance Challenges, November 2016

This annual report provides the Office of Inspector General's (OIG) independent assessment of the top management and performance challenges facing NASA, which we organize under the following topics:

- Positioning NASA for Deep Space Exploration
- Managing the International Space Station and the Commercial Cargo and Crew Programs
- Managing NASA's Science Portfolio
- Overhauling NASA's Information Technology Governance
- Securing NASA's Information Technology Systems and Data
- Addressing NASA's Aging Infrastructure and Facilities
- Ensuring the Integrity of NASA's Contracting and Grants Processes
- Ensuring the Continued Efficacy of the Space Communications Networks

In deciding whether to identify an issue as a top challenge, we considered its significance in relation to NASA's mission; whether its underlying causes are systemic in nature; its susceptibility to fraud, waste, and abuse; and the Agency's progress in addressing it. The challenges described in this report track, in most major respects, those we identified in our November 2015 report, and like last year, are not listed in priority order.

Positioning NASA for Deep Space Exploration

NASA's long-term objective for its human exploration program is a crewed mission to Mars. To meet this challenging goal, the Agency must develop more sophisticated rockets, capsules, and related hardware, as well as strategies to mitigate the risks posed by radiation and other space-induced hazards that could prevent astronauts from performing their missions or affect their mental and physical health. Successful development of the Space Launch System (SLS), the Orion Multi-Purpose Crew Vehicle (Orion), and launch infrastructure under development by the Agency's Ground Systems Development and Operations (GSDO) Program are among the projects critical to achieving NASA's human exploration goals beyond low Earth orbit.

Space Launch System

The NASA Authorization Act of 2010 directed the Agency to develop a Space Launch System as a follow-on to the Space Shuttle and prepare infrastructure at Kennedy Space Center (Kennedy) to enable processing and launch of the system as a key component in expanding human presence beyond low Earth orbit.[1] To fulfill this direction, NASA established the SLS, Orion, and GSDO programs. The Agency plans to develop three progressively more powerful SLS launch vehicles and the Orion capsule to transport humans and

[1] The National Aeronautics and Space Administration Authorization Act of 2010, Pub. L. No. 111-267, 124 Stat. 2805.

cargo into space and has committed to a launch readiness date for the first test flight of the SLS-Orion combination no later than November 2018, with the first crewed flight expected no later than 2023. NASA is using the Space Shuttle's main engine to power the SLS and designing the vehicle with an evolvable architecture that can be tailored to accommodate longer and more ambitious missions. Initial versions will be capable of lifting 70-metric tons and use an interim cryogenic propulsion stage to propel Orion around the Moon on Exploration Mission-1 (EM-1) in 2018. Later versions of the SLS will be designed to lift 130-metric tons and incorporate an upper stage to travel to deep space.

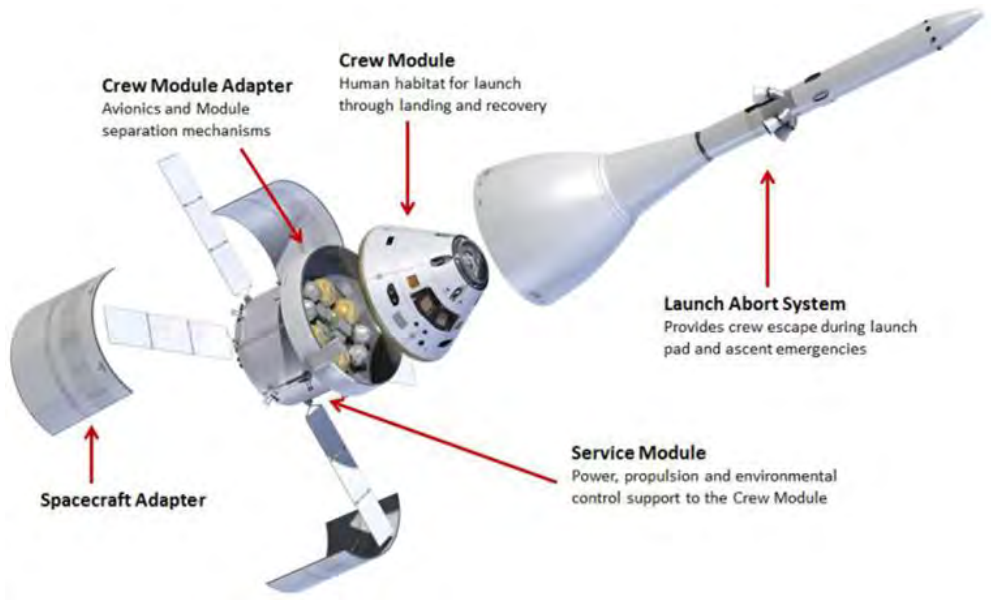
In July 2016, the Government Accountability Office (GAO) reported that the SLS Program has made solid progress in resolving several technical issues and maturing the design of the launch system. However, the Program's management of risks such as late delivery of core stage components and development of flight software coupled with the upcoming integration and test phase has put pressure on the Program's cost and schedule reserves and therefore threatened the November 2018 launch readiness goal.[2] Further, unforeseen technical challenges are likely to arise once the Program reaches final integration and integration with its companion programs – challenges that are likely to place further pressure on the SLS Program's cost and schedule reserves.

Orion

Orion will be mounted atop the SLS and serve as the crew vehicle for up to four astronauts. Orion has four major components: a crew module; a service module; a spacecraft adapter that connects the vehicle to the rocket; and a launch abort system (see Figure 1). NASA began developing Orion in 2006 as part of the Agency's Constellation Program and had spent about $3.7 billion on the effort when the Constellation Program was cancelled in 2010. Since then, NASA has spent about $1 billion annually, or about 6 percent of its overall budget, on the Orion Program. According to current estimates, the Agency will have devoted approximately $17 billion to the Program by the time Orion makes its first crewed flight in April 2023.

[2] GAO, "NASA Human Space Exploration: Opportunity Nears to Reassess Launch Vehicle and Ground Systems Cost and Schedule" (GAO-16-612, July 27, 2016).

Figure 1: Orion Components



Source: NASA.

As of late 2016, NASA had completed one mission and planned three additional missions for Orion:

- *Exploration Flight Test-1*, an uncrewed mission in December 2014 on a Delta IV rocket.
- *EM-1*, a 22- to 25-day uncrewed lunar orbit mission scheduled for September 2018 that will be the first launch of the combined SLS-Orion system.
- *Ascent Abort Test 2*, scheduled for December 2019 when NASA plans to launch a mock-up of Orion to test its launch abort and other systems
- *Exploration Mission-2 (EM-2),* the first crewed flight for the combined system to lunar orbit with a promised launch no later than April 2023. However, the Orion Program has been working toward an August 2021 launch date for EM-2 in an effort to reduce costs.

In an September 2016 audit, we reported the Orion Program met several key development milestones on the path to EM-2 but much work remains, including evaluating options related to the delayed delivery of the service module being developed by the European Space Agency (the European Service Module); continuing mitigation for seven critical risks while operating with a less-than-optimal budget profile for a developmental project; addressing a potential shortfall of $382 million in reserves managed by prime contractor Lockheed Martin Corporation; and successfully launching and recovering EM-1 after its test flight.[3] At the same time, Program officials are working toward an optimistic internal launch date of August 2021 for EM-2 – a date 20 months earlier than the Agency's external commitment date of April 2023. We noted our concern that such an approach, particularly given the Program's flat budget profile, has led the Program to defer addressing several technical tasks to later in the development cycle, which in turn could delay the Program's schedule, increase costs, and negatively affect safety.

[3] NASA OIG, "NASA's Management of the Orion Multi-Purpose Crew Vehicle Program" (IG-16-029, September 6, 2016).

Over its life, the Orion Program has experienced funding instability both in terms of overall budget amounts and the erratic timing of receipt of its annual appropriation. The most effective budget profile for complex space system development programs provides steady funding in the early stages and increased funding during the middle stages of development. In contrast, the Orion Program's budget profile through at least 2018 has been nearly flat. Program officials acknowledged this funding trajectory increased the risk that costly design changes may be needed in later stages of development. In addition, they noted that receiving funding between 4 and 8 months after the start of fiscal years (FY) 2012 through 2016 affected their ability to perform work as planned.

We also found Lockheed Martin is expending funds at a higher rate than both the Orion Program and the company expected and that, if continued, would deplete its management reserve account almost a year before the planned launch of EM-1. Although Program officials acknowledged the current depletion rate is high, they believe it unlikely the company will continue to draw at that rate and noted that, if the reserve is depleted before the EM-2 launch, Lockheed could cover the costs or NASA could draw on other Agency funds. In our judgment, Orion Program managers would be better informed by formally addressing Lockheed's use of the management reserve as a Program cost risk.

To improve the likelihood Orion is safely operated and developed on cost and schedule, we made four recommendations to NASA in our audit, including reevaluating the internal launch readiness dates for EM-1 and EM-2. NASA concurred with all four recommendations.

Ground Systems Development and Operations Program

NASA's GSDO Program is modifying infrastructure at Kennedy formerly used for the Space Shuttle to prepare for launch of the SLS and Orion, including refurbishing the crawler transporter that will transport the SLS to the launch pad and modifying the mobile launcher and tower (originally built for the Constellation Program's Ares I rocket), the Vehicle Assembly Building, and Launch Pad 39B. In 2015, we reported GSDO had made steady progress on the major equipment and facilities modernization initiatives needed to launch SLS and Orion, but significant technical and programmatic challenges originating primarily from interdependencies between the GSDO, SLS, and Orion programs remained before NASA could meet a November 2018 launch date.[4] Similarly, GAO reported in July 2016 that although the Program is making progress in modifying selected facilities and equipment to support SLS and Orion, it is encountering technical challenges that require time and money, which in turn has reduced cost and schedule reserves that threaten the November 2018 launch readiness goal.[5]

As a follow-up to our 2015 report on the GSDO Program, we examined in depth NASA's management of the Program's software development effort known as the Spaceport Command and Control System (SCCS). SCSS is a software system that will control pumps, motors, valves, power supplies, and other ground equipment; record and retrieve data from systems before and during launch; and monitor the health and status of spacecraft as they prepare for and launch. To develop the SCCS, NASA is writing a large amount of computer code to "glue" together multiple existing software products or, in some cases, the parts of those products the Agency deems most effective for its purposes. In the past, NASA has experienced difficulties with similar large, complex software development efforts. For example,

[4] NASA OIG, "NASA's Launch Support and Infrastructure Modernization: Assessment of the Ground Systems Needed to Launch SLS and Orion" (IG-15-012, March 18, 2015).

[5] GAO-16-612.

between 1995 and 2002 the Agency spent more than $500 million on two separate attempts to update command and control software at Kennedy, both of which failed to meet their objectives and were substantially scaled back or cancelled prior to completion.

In a March 2016 audit, we reported the SCCS development effort had significantly exceeded its initial cost and schedule estimates.[6] Compared to FY 2012 projections, development costs had increased approximately 77 percent to $207.4 million and the release of a fully operational version had slipped by 14 months from July 2016 to September 2017. In addition, several planned capabilities had been deferred because of cost and timing pressures, including the ability to automatically detect the root cause of specific equipment and system failures, without which it will be more difficult for controllers and engineers to quickly diagnose and resolve issues. Although NASA officials believe the SCCS will operate safely without these capabilities, they acknowledge the reduced capability could affect the ability to react to unexpected issues during launch operations and potentially impact the launch schedule for the combined SLS-Orion system.

The root of these issues largely stem from NASA's implementation of a June 2006 decision to integrate multiple products or, in some cases, parts of products rather than developing software in-house or buying an off-the-shelf product. Writing computer code to "glue" together nine disparate products turned out to be more complex and expensive than anticipated. As of January 2016, Agency personnel had developed 2.5 million lines of "glue-ware" with almost two more years of development activity planned. In comparison, NASA re-engineered the Hubble Space Telescope command and control system by integrating 30 products with approximately 500,000 lines of "glue-ware" code.
We noted that NASA's 2006 decision may no longer be the most prudent course of action given significant advances in commercial command and control software over the past 10 years. For example, the two companies under contract with NASA to deliver supplies to the International Space Station (ISS or Station) – Orbital Sciences Corporation (Orbital) and Space Exploration Technologies Corporation (SpaceX) – both use commercial command and control software products. Therefore, we recommended NASA commission an independent assessment to evaluate the status of the SCCS software development effort and determine the steps needed to reduce the risk of further cost, schedule, and performance issues, including consideration of acquiring commercial command and control software to replace some or all of the system currently under development. NASA agreed to take this step once software for EM-1 is successfully delivered, which is currently expected in early 2017.

Management of Health and Human Performance Risks

Apart from the tremendous engineering challenges in launching and returning astronauts safely to Earth, humans living in space experience a range of physiological changes that can affect their ability to perform necessary mission functions and, in the long term, lead to cancers, damaged vision, reduced bone strength, and other harm to their health and wellbeing. Although NASA has developed mitigation strategies to reduce the impact of most of the risks associated with travel in low Earth orbit, the Agency's plans to send humans deeper into space for extended periods of time will expose astronauts to new and increased physical and psychological hazards.

In October 2005, NASA established the Human Research Program to focus Agency research investment on investigating and mitigating the highest risks to astronaut health and performance. The Program conducts basic, applied, and operational research with the goal of increasing understanding of and

[6] NASA OIG, "Audit of the Spaceport Command and Control System" (IG-16-015, March 28, 2016).

developing countermeasures for 23 of the 30 human health and performance risks and the 2 "concerns" NASA has identified.[7] In 2014, the Program completed a detailed schedule known as the Path to Risk Reduction outlining a strategy for how it plans to develop countermeasures for the 23 risks. In February 2015, the Program reported that the majority of risks for ISS missions up to a year in duration could be mitigated to an acceptable level; however, more than half of the risks for a 3-year planetary mission, such as a trip to Mars, remain unmitigated.

In an October 2015 audit, we examined NASA's efforts to manage the health and human performance risks posed by space exploration.[8] Although the Agency continues to improve its process for identifying and managing health and human performance risks associated with space flight, we believe that given the current state of knowledge NASA's risk mitigation schedule is optimistic and the Agency will not develop countermeasures for many deep space risks until the 2030s at the earliest. Moreover, the Agency may be unable to develop countermeasures that will lower the risk to deep space travelers to a level commensurate with Agency standards for low Earth orbit missions. Accordingly, the astronauts chosen to make at least the initial forays into deep space may have to accept a higher level of risk than those on missions to the ISS. We also found that NASA cannot accurately report the true costs of developing countermeasures for the identified risks.

Furthermore, NASA's management of crew health risks could benefit from increased efforts to integrate expertise from all relevant disciplines. While many life science specialists attempt to utilize the range of available expertise both inside and outside the Agency, NASA lacks a clear path for maximizing expertise and data at both the organizational and Agency level. For example, NASA has no formalized requirements for integrating human health and research among life sciences subject matter experts, nor does the Agency maintain a centralized point of coordination to identify key integration points for human health. Moreover, integrating the experiences of NASA's engineering and safety efforts would benefit the outside life sciences community. The lack of a coordinated, integrated, and strategic approach may result in more time consuming and costly efforts to develop countermeasures to the numerous human health and performance risks associated with deep space missions.

According to NASA's Space Flight Human System Standards, the human system should be viewed as an integral part of overall vehicle design. In other words, the standards of the human system should be centrally incorporated into vehicle design, mission architecture, countermeasures, and research. Several senior Agency officials we met with noted that although NASA has traditionally and successfully operated with a vehicle-centered design focus, a shift to a more human-centered design is necessary for missions to Mars and other distant exploration goals. While Agency officials agreed that a shift in the Agency's focus is required, they offered little insight into how NASA would effectively utilize human-centered design in mission planning and vehicle design.

In order to ensure NASA management has the best possible information available to make decisions related to human health and performance risks to Agency missions, we made six recommendations, including that the Path to Risk Reduction accurately reflect the status of research and realistic timeframes for countermeasure development. As of September 2016, NASA had implemented all six recommendations.

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[7] "Concerns" are issues the Agency has not yet accepted as risks.

[8] NASA OIG, "NASA's Efforts to Manage Health and Human Performance Risks for Space Exploration" (IG-16-003, October 29, 2015).

Managing the International Space Station and the Commercial Cargo and Crew Programs

In November 2015, NASA formally extended the life of the ISS through 2024, ensuring this unique facility, which has operated in low Earth orbit for more than 15 years, remains available to support research into the development of new exploration technologies and ways to mitigate the dangers posed by deep space travel.[9] A critical component of sustaining the ISS is ensuring safe and reliable transportation of cargo and crew to and from the Station.

International Space Station

The result of an international effort to build and operate a permanently crewed space station, the ISS is a groundbreaking technological achievement and a key part of NASA's plans to send humans to Mars. Specifically, the Agency utilizes the ISS as a research platform to develop countermeasures to mitigate a variety of risks associated with human travel and long-term habitation in space. The Station also serves as a laboratory for NASA and other Government agencies and private entities to conduct scientific research in areas such as medicine, robotics, manufacturing, and propulsion.

With its plan to continue Station operations into the next decade, NASA must ensure a spacecraft originally designed and tested for a 15-year life span will continue to operate safely and as economically as possible. Moreover, as it works toward sending astronauts deeper into space for extended periods of time, NASA must continue to be strategic in utilizing the Station's limited research capabilities. The United States has invested more than $84 billion in the ISS over the last 23 years.[10] In FY 2016, NASA's cost to operate the Station – including on-orbit vehicle operations, research, crew transportation, and cargo resupply missions – was almost $3 billion, with the Agency projecting these costs to increase to $3.8 billion by 2021. As we reported in 2014, we believe this estimate is based on overly optimistic assumptions and that actual costs are likely to be higher.[11]

A significant amount of research aboard the ISS is related to understanding and mitigating the health and performance risks associated with human space travel. According to our October 2015 report, as of June 2015 NASA's Human Research Program was managing 25 such risks, including inadequate food and nutrition and radiation exposure.[12] The Station is a platform for research geared toward mitigating many of these risks, including validating effective countermeasures against bone loss and testing new technologies to overcome the challenges associated with preventing, diagnosing, and treating medical conditions during long-duration, exploration missions. However, even after extending Station operations until 2024, NASA will be unable to mitigate several known risks. Accordingly, the Agency needs to prioritize its research to address the most important risks in the time available.

Since late 2011, the Center for the Advancement of Science in Space (CASIS) has managed non-NASA research aboard the ISS under a cooperative agreement with the Agency. Pursuant to this agreement, NASA provides CASIS $15 million annually and expects the organization to raise additional funds from

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[9] In 2009, NASA asked The Boeing Company, the primary ISS contractor, to examine the feasibility of extending Station operations until 2028. Boeing has completed a significant portion of the hardware analysis and is expected to be fully complete by June 2018.

[10] This figure includes $30.7 billion for 37 supporting Space Shuttle flights.

[11] NASA OIG, "Extending the Operational Life of the International Space Station until 2024" (IG-14-031, September 18, 2014).

[12] IG-16-003.

private entities as part of its efforts to encourage companies to self-fund research on the Station. In an April 2015 assessment of the group's activities, the GAO reported CASIS needs to establish better metrics for measuring program performance, including measurable targets.[13] In early 2016, the NASA Advisory Council recommended the Agency conduct an internal evaluation of its "top priority research directly related to the journey to Mars" and determine whether resources such as crew time and transportation of research materials associated with non-NASA research on the Station could be reallocated to advance that journey. We plan to initiate a follow-up review in FY 2017 examining ISS utilization that will include an assessment of CASIS and its efforts to spur private research on the Station.

While the amount of research being conducted on the ISS has increased over the past 6 years, several factors continue to limit full utilization. Most pointedly, until a seventh crew member is brought onboard, NASA will not be in a position to maximize the amount of crew time dedicated to research on the Station.[14] Moreover, the failures of two commercial resupply missions – a SpaceX mission in June 2015 and an Orbital mission in October 2014 – have led to compressed launch schedules in FYs 2016 and 2017, with 11 cargo resupply missions in addition to 7 Russian cargo missions and 1 Japanese cargo mission scheduled to arrive at the Station. In mid-2014, NASA astronauts were spending as much as 44 hours per week on research-related activities. While NASA officials stated that the number of research hours will not fall below the 35-hour per week minimum, the total time devoted to research may decrease from 2014 levels due to the time astronauts will spend receiving, unpacking, and repacking cargo vehicles.

Commercial Transportation to the ISS

For many years, NASA used the Space Shuttle to ferry astronauts and materials to the ISS. With the Shuttle's retirement in 2011, NASA has invested in a different model for transporting cargo and crew to the ISS by working with U.S. corporations to develop privately owned and operated transportation systems. Unlike the Shuttle, NASA does not own these systems but rather purchases flights from the companies to carry NASA supplies and crew to the ISS.

Cargo Resupply

Between 2006 and 2008, NASA entered into a series of funded Space Act Agreements with Orbital, SpaceX, and other private companies to stimulate development of space flight systems capable of transporting cargo to the ISS.[15] In 2008, while development efforts were still underway, NASA awarded fixed-price contracts valued at $1.9 billion and $1.6 billion to Orbital and SpaceX, respectively, for a series of resupply missions to the ISS known as Commercial Resupply Services (CRS-1) contracts. NASA

[13] GAO, "International Space Station: Measurable Performance Targets and Documentation Needed to Better Assess Management of National Laboratory" (GAO-15-397, April 27, 2015).

[14] Although the ISS is capable of supporting a seven-person crew, currently only six individuals can be on Station at one time. The Russian Soyuz capsule, currently the only vehicle transporting astronauts to the Station, has a three-person capacity and only two Soyuz capsules can be attached to the Station simultaneously.

[15] NASA also bartered with the Japan Aerospace Exploration Agency for cargo transportation on Japan's H-II Transfer Vehicle and can place a small amount of upmass on the Russian space agency's Progress cargo vehicle. In the past, NASA sent cargo to the ISS on the European Space Agency's Automated Transfer Vehicle, which made its final delivery to the ISS in July 2014.

selected two companies to ensure redundancy if one was unable to perform. The contracted services include delivery of supplies and equipment (upmass) to the Station and, depending on the mission, return of equipment and experiments and disposal of waste (downmass) to Earth.[16]

NASA subsequently extended SpaceX's contract into 2018 and issued task orders for 8 additional flights for a total of 20 missions. Similarly, Orbital's contract has been extended into 2018 with 3 additional flights for a total of 11 missions.[17] As of July 2016, Orbital had received $2.2 billion and SpaceX $1.9 billion from NASA under the CRS-1 contract.

Both companies have experienced launch failures. In October 2014, Orbital's third delivery mission failed during lift-off, causing the vehicle to crash near the launch pad and destroying the company's Antares rocket and Cygnus spacecraft as well as all cargo aboard. The mishap also caused $15 million in damage to the Virginia Commercial Space Flight Authority's launch pad and supporting facilities at NASA's Wallops Flight Facility on Virginia's Eastern Shore. Following an investigation and acceptance by NASA of the company's Return to Flight Plan, Orbital resumed resupply missions in December 2015 and, as of September 2016, had completed two successful missions since using an Atlas V launch vehicle and its Cygnus capsule. Orbital is planning to use its redesigned Antares rocket for its next mission anticipated in October 2016.

Similarly, in June 2015 SpaceX's seventh resupply mission (SPX-7) exploded shortly after takeoff from Cape Canaveral Air Force Station in Florida, resulting in a total loss of all cargo aboard. Like Orbital, SpaceX suspended resupply missions until completion of an investigation and acceptance by NASA of a Return to Flight Plan.[18]

SpaceX resumed resupply missions in April 2016 and completed two successful cargo flights for NASA when on September 1, 2016, a Falcon 9 rocket exploded as it was being prepared for a static fire test, destroying the rocket and its commercial satellite payload and damaging the launch pad, which the company leases from the Air Force.[19] Although this was not a NASA mission, because of its contracts with SpaceX to deliver cargo and eventually crew to the ISS, NASA needs to understand the cause of the mishap and ensure the company takes appropriate steps to prevent similar incidents in the future. Accordingly, NASA is both participating in the company's investigation and conducting its own independent review of the failure. As of September 2016, neither SpaceX nor NASA had announced the results of their reviews or the date when SpaceX plans to resume commercial and NASA launches.

While SpaceX completes the processes necessary to return to flight, supplies and experiments will be ferried to the ISS by Orbital and Japan's H-2 Transfer Vehicle. In August 2016, the Japanese space agency announced the H-2 launch scheduled for October 1, 2016, would be delayed because of an air leak in the spacecraft. Moreover, until SpaceX resumes flights, NASA will lack the capacity to return experiments and other items to Earth, as the company is the only provider with downmass capability.

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[16] The SpaceX capsule returns intact and therefore can carry experiments and other cargo back to Earth. In contrast, Orbital's capsule burns up upon reentry to Earth's atmosphere and therefore removes only waste from the Station.

[17] As a result of these additional missions, contract values increased to more than $2 billion for each company.

[18] In addition to the Orbital and SpaceX failures, a Russian Progress cargo mission failed to reach the ISS in April 2015.

[19] A static fire test involves a full propellant loading sequence, launch countdown and engine ignition operations, and testing of the launch pad's high-volume water deluge system.

In September 2015, we examined the effects of the Orbital failure on resupply of the ISS, finding Orbital's Return to Flight Plan contained technical and operational risks. Specifically, we found the company's plan to drop one of its five remaining previously scheduled resupply flights and carry the promised cargo in four missions may have disadvantaged NASA by decreasing the Agency's flexibility in choosing the type and size of cargo Orbital transports to the ISS.[20]

In June 2016, we issued a similar examination of the SpaceX cargo failure. We found the loss of SPX-7 and the shift of SpaceX's eighth resupply mission into 2016 resulted in approximately 3.48 metric tons of pressurized cargo scheduled for delivery in FY 2015 not arriving on the Station. NASA absorbed this loss by placing additional upmass on two earlier SpaceX missions, a Japanese cargo flight, and six Russian flights, thereby reducing the total upmass shortfall from 3.48 to 2.63 metric tons.[21]

The most significant item lost during the SPX-7 mishap was the first of two Docking Adapters necessary to support upcoming commercial crew missions. Although NASA had planned to have two adapters installed on the Station before the first commercial crew demonstration mission scheduled for May 2017, it is now likely there will be only one installed in time for these missions. Having only one adapter means that a commercial crew vehicle will not be able to dock with the ISS if technical issues arise with the single available docking port. ISS Program officials told us they plan to have the second adapter installed before regular commercial crew rotations are scheduled to begin in late 2018.

We also found NASA effectively managed its commercial resupply contract with SpaceX to reduce cost and financial risk by taking advantage of multiple mission pricing discounts and negotiating equitable adjustments of significant value to the Agency. However, NASA did not fully utilize the unpressurized cargo space available in the Dragon 1 capsule trunk for the first seven cargo missions, averaging 423 kg for SPX-3 through SPX-7 when the trunk is capable of carrying more. The ISS Program noted that unpressurized payloads depend on manifest priority, payload availability, and mission risk, and acknowledged it struggled to fully utilize this space on early missions. As of June 2016, Agency cargo manifests show full trunks on all future SpaceX cargo resupply missions.

Our report also examined the Agency's risk management approach for commercial cargo launches, which deviates from existing procedures for evaluating launch risks. In practice, NASA has treated all commercial resupply missions as the lowest level risk classification irrespective of the cargo's value and relies primarily on its commercial partners to evaluate and mitigate launch risks. As a result, risk mitigation procedures are not consistently employed and the subjective launch ratings the Agency uses provide insufficient information to NASA management concerning actual launch risks. Finally, we noted NASA does not have an official, coordinated, and consistent mishap investigation policy for commercial resupply launches, which could affect its ability to determine the root cause of a launch failure and ensure corrective actions are implemented.

In January 2016, NASA awarded the second round of CRS (CRS-2) contracts to Orbital, SpaceX, and the Sierra Nevada Corporation (Sierra Nevada). The maximum combined potential value of the CRS-2 contracts is $14 billion with a period of performance from 2016 through 2024.[22] NASA is expected to order a minimum of six missions from each provider at fixed prices with specified cargo amounts and

[20] NASA OIG, "NASA's Response to Orbital's October 2014 Launch Failure: Impacts on Commercial Resupply of the International Space Station" (IG-15-023, September 17, 2015).

[21] NASA OIG, "NASA's Response to SpaceX's June 2015 Launch Failure: Impacts on Commercial Resupply of the International Space Station" (IG-16-013, June 28, 2016).

[22] The first CRS-2 missions are expected in 2019.

performance dates based on the Station's needs. SpaceX and Orbital will continue to fly capsule designs similar to those used under their CRS-1 contracts while Sierra Nevada will use its Dream Chaser, a winged vehicle that resembles a mini Space Shuttle and, like the Shuttle, launches aboard a rocket but glides back to Earth to land on a runway.

Crew Transportation

Since the Space Shuttle Program ended in July 2011, the United States has lacked a domestic capability to transport crew to the ISS, instead relying on the Russian Federal Space Agency (Roscosmos) to ferry astronauts at prices ranging from $21 million to $82 million per roundtrip. Prior to the end of the Shuttle Program, NASA began working with several U.S. companies to develop the capability to provide safe, reliable, and cost-effective crew transportation to and from the ISS and low Earth orbit. The goal of the Commercial Crew Program is to foster an industry that would meet the Agency's transportation needs as well as those of other Government and nongovernmental entities.

As of May 2016, NASA had spent approximately $3.4 billion on the Commercial Crew Program. The final phase of the effort began in September 2014 when NASA awarded SpaceX and The Boeing Company (Boeing) firm-fixed-price contracts to complete development of their crew transportation systems and, assuming they meet the Agency's safety and performance requirements, receive certification to begin flying astronauts to the ISS on a regular basis.

While NASA imposed the same design requirements on both contractors, Boeing and SpaceX were permitted to establish additional milestones and target completion dates to meet both those requirements and the needs of their individual programs. As such, the contractors have different approaches to developing and launching crewed missions. Boeing plans to use a United Launch Alliance Atlas V launch vehicle to carry its CST-100 Starliner capsule to the ISS. The Atlas V has a long history of successful uncrewed launches – 64 between August 2002 and July 2016, including Orbital cargo missions to the ISS in December 2015 and March 2016. Boeing plans to launch from Cape Canaveral Air Force Station's Space Launch Complex 41 and is assembling and processing the Starliner at the Kennedy Space Center's Commercial Crew and Cargo Processing Facility, which NASA used for 20 years to process the Space Shuttle between flights.

Boeing's Launch Site at Cape Canaveral Air Force Station

Source: NASA.

SpaceX plans to launch its Crew Dragon capsule on the Falcon 9, a rocket of its own design and manufacture. Although a relative newcomer to the rocket industry, SpaceX made 27 successful launches between June 2010 and July 2016, including 8 cargo resupply trips to the ISS, with only 1 failure.[23] SpaceX is modifying a former Space Shuttle launch pad at Kennedy to accommodate launches of its Falcon 9/Crew Dragon combination. Although both companies are designing their capsules to carry up to seven crew members (or the equivalent combination of crew and cargo), the vehicles will use different landing approaches, with Boeing planning to land on a dry surface and SpaceX, at least initially, planning a water-based landing.

SpaceX Launch Site at the Kennedy Space Center

Source: SpaceX.

We first reported on the status of and challenges facing the Commercial Crew Program in November 2013.[24] At that time, we noted the Program had received only 38 percent of its requested funding for FYs 2011 through 2013, and as a result NASA had delayed the first crewed mission to the ISS from 2015 to at least 2017. We also reported that although Boeing and SpaceX were making steady progress in the initial stages of development, the Program faced several obstacles, including an unstable funding stream, aligning cost estimates with Program schedule, providing timely requirement and certification guidance to Boeing and SpaceX, and coordinating with other Federal agencies that have a stake in manned space flight. We concluded that failure to address these challenges in a timely manner could significantly delay the availability of commercial crew transportation services and extend U.S. reliance on the Russians.

In a follow-up audit issued in September 2016, we reported the Commercial Crew Program continues to face multiple challenges that will likely delay the first routine flight carrying NASA astronauts to the ISS until late 2018 – more than 3 years after NASA's original 2015 goal.[25] While past funding shortfalls have contributed to the delay, technical challenges with the contractors' spacecraft designs are now driving schedule slippages. For Boeing, these include issues relating to the effects of vibrations from intense sound waves generated during launch and challenges regarding vehicle mass. For SpaceX, delays resulted from a change in capsule design to enable a water-based rather than ground-based landing and related concerns that the capsule would take on excessive water.

Moreover, both companies must satisfy NASA's safety review process to ensure they meet Agency requirements for "human rating" their vehicles. As part of the certification process, Boeing and SpaceX conduct safety reviews and report to NASA on potential hazards and how they plan to mitigate these risks. We found significant delays in NASA's evaluation and approval of these hazard reports and related requests for variances from NASA requirements that increase the risk that costly redesign work may be required late in development that could further delay vehicle certification. While NASA has a goal of

[23] As noted previously, SpaceX suffered a second failure in September 2016 as it was preparing a mission for a commercial client.

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

[25] NASA OIG, "NASA's Commercial Crew Program: Update of Development and Certification Efforts" (IG-16-028, September 1, 2016).

completing its review within 8 weeks of receiving a hazard report, the contractors told us this process can take as long as 6 months. We also found that NASA does not monitor the overall timeliness of its safety review process.

Given delays in the Commercial Crew Program, NASA has extended its contract with the Russian Space Agency for astronaut transportation through 2018 at a cost of $490 million, or $82 million each, for six seats. If the Commercial Crew Program experiences additional delays, NASA may need to buy additional seats from Russia to ensure a continued U.S. presence on the ISS.

Managing NASA's Science Portfolio

With a relatively constant annual budget averaging approximately $5 billion since FY 2009, NASA's Science Mission Directorate (SMD) oversees more than 100 projects and programs in various phases of development and operation. The selection and balance of NASA's science missions is heavily influenced by stakeholders external to the Agency. The science community – as represented by the National Research Council (NRC) – establishes mission priorities based on a broad consensus within various science research disciplines.[26] Additional stakeholders include the President, Congress, and other Federal and international agencies.

For the most part, NASA develops its SMD portfolio based on priorities set forth in the NRC's decadal surveys on the subject matter areas covered by the SMD's four divisions: Astrophysics, Earth Science, Heliophysics, and Planetary Science. Each survey lists the NRC's recommendations by priority order (e.g., the 2007 Earth Science Decadal Survey grouped missions by Tier 1 through Tier 3, with Tier 1 being the highest priority).

Although NASA is addressing the NRC's top priorities in each of the science disciplines, past surveys generally underestimated the cost of recommended missions and overestimated the amount of money NASA would have to dedicate to them. For example, in the 2007 Earth Science Decadal Survey the NRC recommended four Tier 1 missions for launch by 2013.[27] However, NASA has launched only one of these missions – the Soil Moisture Active-Passive mission in January 2015. Of the remaining three, the next planned launch is the Ice, Cloud, and Land Elevation Satellite-2 (ICESat-2) in late 2017. Similarly, although the 2010 Astrophysics Decadal Survey recommended launch of the Wide Field Infrared Survey Telescope launch by 2020, NASA's FY 2017 budget request supports a launch schedule no earlier than 2025.[28]

In addition to Decadal Surveys, NASA also receives input on science priorities from Congress. For example, the 2016 Consolidated Appropriations Act directed NASA to spend $175 million in FY 2016 to develop a mission to Europa, a moon of Jupiter, when the Agency had requested only $30 million for the mission that year.[29] Further, although NASA study teams had determined that a "fly-by" mission of Europa could accomplish 80-90 percent of the science that an orbiter mission would achieve for about

[26] The NRC is the research arm of the National Academy of Sciences, the National Academy of Engineering, and the National Academy of Medicine, and issues reports to help improve public policy, understanding, and education in matters of science, technology, and health.

[27] NRC, "Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond," 2007.

[28] NRC, "New Worlds, New Horizons in Astronomy and Astrophysics," 2010.

[29] Public L. No. 114-113, Consolidated Appropriations Act of 2016, December 18, 2015.

50 percent of the cost, the Act directed NASA to fund an orbiter and lander. In addition, the Act directed both the exact launch vehicle and timetable – specifically, the SLS rocket (currently under development) and a launch date no later than 2022.

NASA works collaboratively with foreign space agencies on many of its science projects and in 2016 was managing more than 750 international agreements with 125 different countries, approximately half related to science. For example, the Global Precipitation Measurement (GPM) mission is an international network of satellites designed to measure precipitation in the Earth's atmosphere. While the primary GPM spacecraft launched in February 2014 to provide a reference standard for precipitation measurements from space was developed by NASA and the Japanese space agency, the space agencies of several other countries, including France and India, launched research satellites as part of the mission.

In a May 2016 audit, we reported NASA faces significant challenges when using international partnerships and discussed the potential impacts when partners do not meet expectations.[30] First, the process of developing agreements with foreign space agencies requires approval from the Department of State, which often takes many months if not years to obtain. Second, U.S. export control regulations can hinder dialogue between NASA and its partners, causing frustration with project planning and implementation and reducing the competitiveness of the U.S. space industry. Third, the lack of strong, centralized international space coordination groups and restrictions on the number of NASA employees who are permitted to attend international conferences make dialog between NASA and its partners more difficult. Finally, both the U.S. political process and geopolitical realities complicate NASA's efforts to expand international partnerships, particularly with the Russian and Chinese space agencies.

Similar to problems encountered with its space exploration programs, NASA has struggled to accurately estimate the amount of time and money required to complete its science projects. The resulting cost and schedule overruns have, in turn, led to challenges in the project development process, diverted funding from other projects, and reduced the number and scope of projects the Agency can undertake. The most prominent recent example of this phenomena is the James Webb Space Telescope (JWST), the largest project in SMD's portfolio. In 2011, NASA increased JWST's life-cycle budget from $4.96 billion to $8.84 billion and delayed its launch 4 years to October 2018. The following year, the Agency moved $156 million from other SMD projects and its Cross Agency Support account to help cover the cost increases. In the following section, we discuss JWST and two other projects with histories of cost growth and schedule slippage.

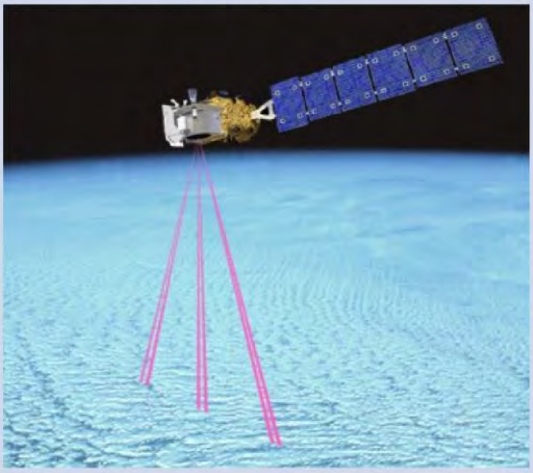
Ice, Cloud, and land Elevation Satellite-2

ICESat-2 is a satellite mission designed to provide the data necessary to determine ice sheet mass balance and track changes in such features as glaciers and sea ice, which will allow scientists to see where ice is flowing, melting, or growing and to investigate the global impacts – such as sea level rise – of these changes. The NRC recommended the mission in its 2007 Earth Science Decadal Survey, with a suggested launch in 2013.

[30] NASA OIG, "NASA's International Partnerships: Capabilities, Benefits, and Challenges" (IG-16-020, May 5, 2016).

In December 2012, NASA baselined ICESat-2with a life-cycle cost of $860 million and a launch date of May 2017.[31] However, managers underestimated the technical complexity of building the satellite's sole instrument – the Advanced Topographic Laser Altimeter System – and therefore significantly understated the cost of and schedule for the mission. In May 2014, NASA revised the baseline to reflect a $1.1 billion life-cycle cost and a planned launch date in June 2018. The funds for this 37 percent increase in costs have been drawn from other projects in the Earth Science Division portfolio. Since rebaselining, NASA has made significant progress and is now anticipating a launch in late 2017.

Artist's Rendering of ICESat-2



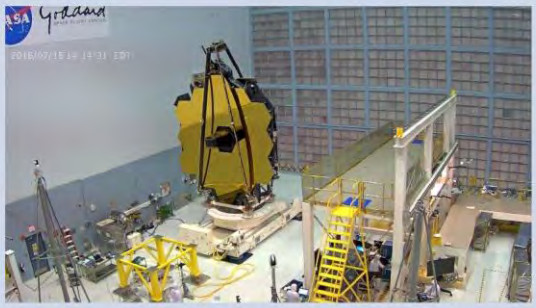
Source: NASA.

James Webb Space Telescope

The scientific successor to the Hubble Space Telescope, JWST is designed to help understand the origin of the first stars and galaxies in the universe, the evolution of stars, the formation of stellar systems, and the nature of celestial objects in our own solar system. The 2001 Astrophysics Decadal Survey identified JWST as its top priority for that decade.[32] However, early cost and schedule estimates – ranging from $1 billion to $3.5 billion, with an expected launch date between 2007 and 2011 – proved overly optimistic, and following a change in the launch vehicle and other revisions in 2005 NASA estimated life-cycle costs at $4.5 billion with a launch date in 2013. Soon after a review team found the 2013 launch date unachievable. Consequently, in 2009 NASA rebaselined JWST with a life-cycle cost estimate of $4.9 billion and a June 2014 launch date. However, soon it became clear that neither that cost estimate nor the 2014 launch date were attainable. Subsequently, NASA restructured the JWST Project and in September 2011 established a revised baseline life-cycle cost estimate of $8.84 billion and an October 2018 launch date.

JWST has made significant progress in the past year, including the installation of all 18 segments of the primary mirror at Goddard Space Flight Center, and remains within its revised baseline cost and schedule. However, manufacturing challenges related to the sunshield have delayed some integration and testing. In addition, major hardware deliveries expected this year are likely to strain the project's reserves.

Assembly of JWST



Source: NASA.

[31] This baseline cost was approximately $75 million higher than initial estimates because NASA had to procure a separate launch vehicle when a plan to share the cost of a launch vehicle with an U.S. Air Force payload did not materialize.

[32] NRC, "Astronomy and Astrophysics in the New Millennium," 2001. Referred to at the time as the Next Generation Space Telescope.

Stratospheric Observatory for Infrared Astronomy

Over the past 7 years, we have twice reported on the developmental challenges facing NASA's Stratospheric Observatory for Infrared Astronomy (SOFIA) Program.[33] SOFIA is an airborne observatory designed to study the universe in the infrared region of the electromagnetic spectrum. Built within the frame of a Boeing 747SP, SOFIA contains an internally mounted 2.7-meter (approximately 9-foot) telescope – developed and provided by the German Aerospace Center – operators expose to the night sky while in flight through a uniquely designed door cavity located at the rear of the plane.[34] SOFIA is particularly well suited for investigating the origin of massive stars and the environment that leads to the formation of planets.

SOFIA in Flight

Source: NASA.

As early as 1998 – about 2 years into development – the SOFIA Program began to experience schedule delays and cost overruns. The 2001 Astrophysics Decadal expected SOFIA to be operational in 2002; however, by 2006 SOFIA had been in development for 10 years, was about 5 years behind schedule, and the prime contract value had increased by $217 million to approximately $528 million. NASA's FY 2007 budget request withheld funding from the Program pending an independent review. The review resulted in a major reorganization of the Program that required NASA to rebalance the astrophysics portfolio to accommodate SOFIA's nearly $3 billion life-cycle cost.

Less than 10 years after first proposing to cancel the Program and within months of reaching full operational capability, NASA proposed to greatly reduce funding for SOFIA in its FY 2015 budget request, intending to divert its $80 million annual operating budget to support other science missions. Within a year, however, Congress restored funding for SOFIA, again necessitating a replan of the Agency's science portfolio.

Joint Cost and Schedule Confidence Level Estimates

As discussed in last year's management challenges report, NASA has developed tools to help improve the fidelity of its cost and schedule estimates.[35] To this end, since 2006, NASA has incorporated progressively more sophisticated estimating techniques into Agency policy, culminating in 2009 with formal adoption of a Joint Cost and Schedule Confidence Level (JCL) requirement.

[33] NASA OIG, "Final Memorandum on Audit of the Stratospheric Observatory for Infrared Astronomy (SOFIA) Program Management Effectiveness" (IG-09-013, March 27, 2009) and "SOFIA: NASA's Stratospheric Observatory for Infrared Astronomy" (IG-14-022, July 9, 2014).

[34] The Boeing 747SP is a modified version of the Boeing 747 jet airliner with a shortened fuselage making it lighter, thus permitting longer range and increased speed relative to other 747 configurations.

[35] NASA OIG, "2015 Report on NASA's Top Management and Performance Challenges" (November 5, 2015).

A JCL analysis generates a representation of the likelihood a project will achieve its objectives within budget and on time. The process uses software tools and models that combine cost, schedule, risk, and uncertainty to evaluate how expected threats and unexpected events affect a project's cost and schedule. To generate this data, project managers develop comprehensive project plans, inputs, and priorities that integrate costs, schedules, risks, and uncertainties.

We examined NASA's JCL process in a September 2015 report.[36] Based on our review of the 22 projects for which NASA had completed a JCL analysis since 2009 (combined price tag of more than $49 billion), we reported that JCL policy appeared to be having a positive impact on NASA's historical challenges with cost and schedule fidelity. That said, we noted the process is still relatively new and evolving and has inherent limitations in that, like any estimating practice, it does not fully address some of the root causes of NASA's project management challenges such as funding instability and underestimation of technical complexity, or the issue of predicting "unknown/unknowns."[37] For example, after the issuance of our September 2015 report, NASA announced it was delaying launch of the Interior Exploration using Seismic Investigations Geodesy and Heat Transport (InSight) when a leak in the primary instrument could not be repaired in time for the planned March 2016 launch.[38] The instrument, provided by France's Centre National d'Études Spatiales, is designed to measure ground movements as small as the diameter of an atom. NASA is now planning for a May 2018 launch date.

Overhauling NASA's Information Technology Governance

In 2016, NASA spent approximately $1.4 billion or 7.3 percent of its $19.3 billion budget on information technology (IT). The Agency's portfolio of IT assets 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. Indeed, IT plays an integral role in every facet of Agency operations, and hundreds of thousands of individuals – from NASA personnel to members of academia to the public – rely on NASA IT systems every day.

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. However, 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.

In June 2013, we examined whether NASA's Office of the Chief Information Officer (OCIO) had the organizational, budgetary, and regulatory framework needed to effectively meet the Agency's varied missions.[39] We found the decentralized nature of NASA's operations and its longstanding culture of autonomy hindered the Agency's ability to implement effective IT governance. Specifically, the Chief Information Officer (CIO) had limited visibility and control over a majority of the Agency's IT investments, operated in an organizational structure that marginalized the authority of the position,

[36] NASA OIG, "Audit of NASA's Joint Cost and Schedule Confidence Level Process" (IG-15-024, September 29, 2015).

[37] "Unknown/unknowns" are future situations that are impossible to predict.

[38] The mission is designed to investigate Mars' interior to increase understanding of how rocky planets formed and evolved.

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

and could not enforce security measures across NASA's computer networks. Moreover, the IT governance structure in place at the time was overly complex and did not function effectively. As a result, Agency managers tended to rely on informal relationships rather than formalized business processes when making IT-related decisions. While other Federal agencies were moving toward a centralized IT structure under which a senior manager has ultimate decision authority over IT budgets and resources, NASA continued to operate under a decentralized model that relegated decision making about critical IT issues to numerous individuals across the Agency, leaving such decisions outside the purview of the Agency CIO. As a result, NASA's IT governance model weakened accountability and did not ensure that IT assets across the Agency were cost effective and secure.

To overcome the barriers that resulted in inefficient and ineffective management of the Agency's IT assets, we made a series of recommendations to overhaul NASA's IT governance structure by centralizing IT functions and establishing the Agency CIO as the top management official responsible for the Agency's entire IT portfolio. This would include empowering the CIO to approve all IT procurements over a monetary threshold that captures the majority of IT expenditures and making the CIO a direct report to the NASA Administrator. We also recommended 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 recommended the NASA Administrator reevaluate the resources of the OCIO to ensure the Office has the appropriate number of personnel with the appropriate skills.

After issuance of our report, NASA established a Business Services Assessment to evaluate the health of and assess opportunities to achieve efficiencies and improve alignment for IT services. The group conducted assessments in six areas and, in May 2015, reported its findings to the Agency's Mission Support Council, which tasked the NASA CIO with developing a plan to respond to the recommendations.

By February 2016, we had closed the recommendations from our 2013 report based on actions NASA has taken as a result of the Business Services Assessment process. However, in March 2016 we opened a follow-up review to evaluate NASA's IT governance in light of the changes the Agency has made. As part of this review, we will examine aspects of NASA's implementation of the Federal Information Technology Acquisition Reform Act (FITARA), which aims to strengthen the role of Federal agency CIOs in overseeing IT investments, acquisitions, and programs. NASA was one of three organizations that received a failing score on its first FITARA score card, a government-wide effort to assess compliance with and performance in four key areas: (1) data center consolidation, (2) IT portfolio review savings, (3) incremental development, and (4) risk assessment transparency.

Securing NASA's Information Technology Systems and Data

NASA manages approximately 1,200 publicly accessible web applications, or about half of all publicly accessible, nonmilitary Federal Government websites.[40] Coupled with the Agency's statutory mission to share scientific information, the large number of networks and websites present unique IT security challenges. For FYs 2014 and 2015, NASA reported 3,044 computer security incidents related to malicious

[40] In 2014, we examined NASA's efforts to identify and assess vulnerabilities on its publicly accessible web applications and mitigate the most severe vulnerabilities before hackers exploit them. NASA OIG, "Security of NASA's Publicly Accessible Web Applications" (IG-14-023, July 10, 2014). Although the OCIO and Center IT security officials have reduced NASA's web presence by eliminating some unused and duplicative web applications, the Agency's remaining publicly accessible web applications continue to present a large target for hackers.

software on or unauthorized access to Agency computers. These incidents included individuals testing their skills to break into NASA systems, well-organized criminal enterprises hacking for profit, and intrusions that may have been sponsored by foreign intelligence services seeking to further their countries' objectives. Moreover, NASA's vast connectivity with educational institutions, research facilities, and other outside organizations offers cybercriminals a larger target than most other Government agencies.

NASA must ensure that its IT systems and associated components are regularly safeguarded, assessed, and monitored to protect against inevitable attack. To assist in this effort, NASA completed a series of initiatives over the past 2 years, including

- expanding network penetration testing and incident response assessments;
- deploying intrusion detection systems across mission, corporate, and research networks;
- increasing web application security scanning;
- implementing intrusion prevention systems;
- expanding anti-phishing exercises Agency-wide; and
- implementing anti-exploitation software to reduce potential incidents.

While the completion of these initiatives improves NASA's security posture, as we have reported in our last five annual evaluations, pursuant to the Federal Information Security Management Act NASA has yet to develop an Agency-wide risk management process specific to information security. Risk management is a comprehensive process that requires an organization to describe the environment in which risk-based decisions are made to access, respond to, and monitor risk over time, and ongoing monitoring is a critical part of an agency's risk management program.

In April 2016, we reported that although NASA has made progress in meeting requirements in support of an Agency-wide information security program, it has not fully implemented key management controls essential to managing that program.[41] Specifically, NASA lacks an Agency-wide risk management framework for information security and an information security architecture. In our judgment, this condition exists because the OCIO has not developed an information security program plan to effectively manage its resources. In addition, the Office experienced a period of transition with different leaders acting in the Senior Agency Information Security Officer role, which caused uncertainty surrounding information security responsibilities at the Agency level. As a result, we believe NASA's information security program could be improved to more effectively protect critical Agency information and related systems.

In November 2015, we initiated a follow-up audit of NASA's use of cloud computing services, a subject we had reported on in 2013.[42] Cloud computing offers the potential for significant cost savings through faster deployment of computing resources, a decreased need to buy hardware or build data centers, and enhanced collaboration capabilities. However, effectively managing the delivery of cloud-computing services requires agencies to develop contracts that address business and security risks and provide a mechanism to monitor agency and cloud provider responsibilities. Because of the wide availability and ease of purchasing services from public cloud providers, a lack of organizational control

[41] NASA OIG, "Review of NASA's Information Security Program" (IG-16-016, April 14, 2016).

[42] NASA OIG "NASA's Progress in Adopting Cloud-Computing Technologies" (IG-13-021, July 2013). We reported the Agency's IT governance and risk management practices impeded NASA from fully realizing the benefits of cloud computing and potentially placed at risk its information stored in the cloud.

over the acquisition of these services can create problems. For example, if cloud-computing services are acquired without proper approvals and oversight, vulnerable systems and sensitive information may be placed in the cloud environment, legal and privacy requirements may go unmet, and costs may quickly rise to unacceptable levels.

In our current audit, we are reviewing whether NASA has implemented Agency-wide plans, procedures, and controls to meet Federal and Agency IT security requirements to protect the confidentiality, integrity, and availability of NASA data maintained by cloud service providers. Moreover, in another ongoing audit we are examining the security of NASA's industrial control systems, which are involved in the operation of launch facilities, wind tunnels, rocket testing facilities, and other critical and supporting infrastructure assets identified by NASA. Specifically, we are reviewing whether NASA has implemented effective physical and logical security controls necessary to protect these systems against physical and cybersecurity threats.

In addition to our audit work, we expend substantial resources investigating IT security issues. OIG investigators have conducted more than 90 investigations of breaches of NASA IT networks over the past 5 years and helped to secure convictions of hackers operating from such wide-ranging locations as Australia, England, Italy, Nigeria, Portugal, Romania, and Turkey. For example, one investigation led to the identification, arrest, and extradition of a Nigerian national for charges related to aggravated identity and credit card theft. After extradition to New York from South Africa, the subject pled guilty to one count of conspiracy to defraud the Federal government and was sentenced to 42 months in prison, deported, and prohibited from reentering the United States. In another case, an Estonian national was sentenced in April 2016 to 7 years and 3 months imprisonment and ordered to forfeit $2.5 million for his role in a cybercriminal scheme that infected dozens of NASA computers and millions of computer systems worldwide.

Addressing NASA's Aging Infrastructure and Facilities

NASA controls approximately 5,000 buildings and structures with an estimated replacement value of about $34 billion, making the Agency one of the largest Federal Government property holders. However, more than 80 percent of the Agency's facilities are 40 or more years old and beyond their design life. While the Agency strives to keep these facilities operational, and when not operational, in sufficient condition so they do not pose a safety hazard, NASA has not been able to fully fund required maintenance for its facilities for many years. In 2016, NASA estimated its deferred maintenance costs at $2.4 billion.

We have dedicated substantial resources over the last 6 years exploring NASA's infrastructure challenges.[43] In doing so, we examined issues ranging from NASA's plans for specific test facilities such

[43] NASA OIG, "Audit of NASA's Requirements for Plum Brook Station" (IG-15-014, April 23, 2015); "Review of NASA's Pressure Vessels and Pressurized Systems Program" (IG-15-019, June 30, 2015); "NASA's Independent Verification and Validation Program" (IG-14-024, July 16, 2014); "Audit of NASA's Environmental Restoration Efforts" (IG-14-021, July 2, 2014); "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).

as Plum Brook Station in Ohio, to management of its Pressure Vessels and Pressurized Systems Program and its Explosive Safety Program, to its environmental remediation efforts.[44]

In a February 2013 audit, we assessed NASA's efforts to reduce unneeded infrastructure and facilities and identified 33 facilities – 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 and that cost the Agency more than $43 million to maintain in FY 2011 alone.[45] We recommended NASA complete a facilities review process begun the year before and ensure such a process was established in policy. We also recommended NASA develop a mechanism for communicating its decisions regarding disposition of facilities to outside stakeholders and implement changes to a NASA database integral to facility management.

In 2012, NASA embarked on an effort to strategically address the technical capabilities required to support current and future Agency goals. Referred to as the Technical Capabilities Assessment Team (TCAT) and championed by the NASA Associate Administrator, this effort sought to provide NASA leadership with detailed information to make informed decisions to ensure the Agency has the right mix of people and assets to carry out its multi-faceted mission. Personnel from NASA's Centers and Mission Directorates, as well as the senior managers responsible for executing the decisions, participated in the nearly 3-year process.

As an outgrowth of the TCAT process, in 2015 NASA established 32 Capability Leadership teams composed of senior technical leaders from the engineering, science, aircraft, and mission operations disciplines. These teams are responsible for continuously assessing their disciplines from an Agency-wide perspective to meet long-term needs, optimize deployment of capabilities across Centers, and transition capabilities no longer needed.

As of August 2016, TCAT and the Capability Leadership teams had assessed 32 technical capabilities, including mission operations, propulsion, and aircraft operations, and issued 36 formal decisions. As a result, the Agency divested 17 aircraft and 21 vacuum chambers, deactivated 1 propulsion test stand, eliminated internal microgravity flight operations, updated several internal memorandums of agreement, and consolidated research and development activities in areas such as propulsion and materials development. While the Agency has exhibited positive momentum in using these processes to evaluate and make decisions regarding its infrastructure and capabilities, we are reviewing the TCAT and Capability Leadership teams' work to assess whether the process will result in meaningful, long-term actions. We expect to issue our report in 2017.

Given the disparity between the Agency's infrastructure and its mission-related needs, as well as the likelihood of ongoing funding concerns, it is imperative NASA move forward aggressively with its infrastructure assessment and 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.

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[44] Pressure vessels and systems include storage tanks, cylinders, and piping that deliver compressed gas or liquid under significant pressure.

[45] IG-13-008.

Ensuring the Integrity of the Contracting and Grants Processes

Approximately 77 percent of NASA's $18 billion FY 2015 budget was spent on contracts to procure goods and services, and the Agency awarded an additional $905 million in grants and cooperative agreements. Accordingly, NASA managers face the ongoing challenge of ensuring the Agency receives fair value for its money and that recipients spend NASA funds appropriately to accomplish stated goals. We seek to assist NASA in these efforts by examining Agency-wide procurement and grant-making processes; auditing individual contracts, grants, and cooperative agreements; and investigating potential misuse of Agency contract and grant funds.

During the past year, the OIG continued to uncover fraud and misconduct related to NASA contracts. For example, working with the National Science Foundation (NSF) OIG and the Defense Criminal Investigative Service (DCIS), we investigated a research professor who made false statements to Government officials to obtain 22 grants and contracts from NASA and other agencies valued at $6.4 million. Specifically, in his award proposals he failed to disclose all of his and his corporation's current and pending grants and contracts, thereby overstating the time he and the corporation could devote to the new projects for which he was applying. He also falsely certified that he was primarily employed by his corporation, when in reality he was employed full-time as a research professor at the University of California San Diego. The investigation further revealed the professor received more than $1.9 million in salary from 2005 to 2013 from his corporation, due in part to the fraudulently obtained grants and contracts. Ultimately, the professor pleaded guilty to wire fraud and was sentenced to 3 years of probation, paid a $175,000 fine, forfeited $180,000, and was debarred from Government contracting for three years.

In another example, an investigation by the NASA OIG, the NSF OIG, the DCIS, and the Internal Revenue Service's Criminal Investigations Division led to convictions of several subcontractors for conspiracy to pay kickbacks to a procurement official employed by a contractor that supplies satellites and satellite parts to NASA and other Government agencies. The subcontractors received prison sentences of up to 3 years and forfeited more than $700,000 in ill-gotten gains.

Given NASA's continued reliance on contractors to provide essential services, the Agency will remain susceptible to contract fraud schemes, including collusion among bidders, employers, and contractors; corrupt payments in the form of bribes and kickbacks; bid manipulation; failure to meet contractual specifications; substitution of products or materials of lesser quality than specified in the contract; use of counterfeit, defective, or used parts; submission of false, inflated, or duplicate invoices; false claims regarding a contractor's abilities or level of experience; and conflicts of interest. Accordingly, NASA must ensure that it maintains proper controls to mitigate the risk and proactively identify fraud.

In 2015, we launched a data analytics initiative to assist to help OIG staff identify contract, grant, and procurement fraud. We are using a variety of statistical and mathematical techniques to gather, analyze, and interpret Agency and open-source data to identify fraud indicators and help target OIG audit and investigations resources.

We also continue to focus audit resources on NASA's multibillion dollar contracting and procurement activities. In FY 2015, NASA spent $5.8 billion on service contracts pursuant to which contractors supplied time, effort, and expertise to perform specified tasks. For example, Kennedy has a $1.9 billion Engineering Services Contract with Vencore Solutions, Inc., to provide the Center with services ranging

from laboratory and shop maintenance to space flight engineering.[46] This cost-reimbursement contract includes award-fee provisions, a baseline, and indefinite-delivery, indefinite-quantity (IDIQ) components. The baseline covers administrative and managerial services, while the IDIQ allows NASA to issue task orders when the need for a particular service arises.

In a May 2016 audit, we found the size and scope of Kennedy's agreement with Vencore has made managing the contract particularly challenging.[47] The cost and tasks included in its baseline and task order components are not clearly defined, managers overseeing the contract may lack appropriate expertise, and cost allocations are not clear. In addition, several tasks Vencore is performing on a cost-reimbursable basis appear more suitable for a fixed-price arrangement. Moreover, NASA has limited its ability to evaluate Vencore's performance by including generic milestones and deliverables in some task orders, as well as employing evaluation standards that do not align with the Federal Acquisition Regulation or the contract's award-fee plan. As a result, NASA's evaluations of Vencore's performance do not consistently support the award-fee scores assigned or the resulting payments, and we questioned more than $450,000 in award-fee payments NASA made to Vencore between FYs 2011 and 2014. Our findings relating to award fees mirrored similar concerns we raised in previous reports.[48]

NASA also faces the ongoing challenge of ensuring grant and cooperative agreement funds are administered appropriately and that recipients are accomplishing stated goals. NASA awards millions of dollars in grants and cooperative agreements annually to facilitate research and fund scholarships, fellowships, and stipends to students and teachers, as well as research by educational institutions or other nonprofit organizations. We conducted several audits during the past year that examined NASA's management of grants and cooperative agreements, including a review of a $3.36 million National Space Grant College and Fellowship Program grant to the University of Texas at Austin to increase interest in science, technology, engineering, and mathematics.[49] We found the University had a strong system of accounting and internal controls to adequately account for expenditures and that the Consortium satisfied the overall performance goals and objectives of the grant.[50] However, we identified deficiencies in the Consortium's management of award funds and NASA's oversight of the grant's cost matching. Specifically, the Consortium inappropriately awarded $2,528 in scholarships to students who were not U.S. citizens and failed to adequately track required cost matching. Similarly, NASA did not adequately verify the Consortium's cost matching efforts.

Over the past 5 years, we have conducted 25 grant fraud investigations resulting in 5 convictions, $638,783 in recoveries, $2,921,583 in civil settlements, 2 suspensions, and 3 debarments. For example, a joint investigation by the NASA OIG, the NSF OIG, and the U.S. Secret Service revealed the owner of a small business spent nearly $800,000 in Federal grant funds on personal expenses, including mortgage payments, private school tuition for his children, vacations, shopping, and wire transfers to family and

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[46] In a cost-reimbursement contract, NASA reimburses contractors for allowable costs they incur producing or delivering the contracted goods or services. Cost-type contracts pose a financial risk to the procuring agency because they do not promise delivery of a good or service at a set price. An award fee is money a contractor may earn in whole or in part by meeting or exceeding predetermined performance criteria.

[47] NASA OIG, "Audit of NASA's Engineering Services Contract at Kennedy Space Center" (IG-16-017, May 5, 2016).

[48] NASA OIG, "Audit of NASA's Management of International Space Station Operations and Maintenance Contracts", (IG-15-021, July 15, 2015); "NASA's Use of Award-fee Contracts", (IG-14-003, November 19, 2013); and "Extending the Operational Life of the International Space Station Until 2024", (IG-14-031, September 18, 2014).

[49] NASA OIG, "Audit of NASA Space Grant Awarded to the University of Texas at Austin" (IG-16-013, February 18, 2016).

[50] The Texas Space Grant Consortium (Consortium) was founded in 1989 and currently has 57 member institutions, including universities, industry, nonprofit organizations, and government agencies. The University of Texas at Austin (University) is the Consortium's lead institution.

friends overseas. The business owner was convicted of 7 counts of wire fraud and 2 counts of submitting false claims and sentenced to 4 months in prison and 1 year of supervised release.

Given the large amount of money at stake, we intend to continue to monitor NASA's administration of its contracts, grants, and cooperative agreement awards.

Ensuring the Continued Efficacy of the Space Communications Network

NASA's satellites and other spacecraft must communicate with Earth to receive commands from human controllers and return scientific data for study. To meet this need, NASA initiated the Space Communications and Navigation (SCaN) Program in 2006 with the goal of creating an integrated Agency-wide space communications and navigation architecture.

The SCaN Program operates three distinct communication networks and manages NASA's use of the electromagnetic spectrum. SCaN's communication networks are (1) the Near Earth Network, which covers low Earth orbit and portions of geosynchronous and lunar orbit; (2) the Space Network, which controls the Tracking and Data Relay Satellites through a network of geographically diverse ground systems and covers communications with satellites in geostationary orbit, including the ISS and the Hubble Space Telescope; and (3) the Deep Space Network, which covers communications beyond low Earth orbit, including planetary exploration missions to Mars and beyond. The spectrum encompasses various types of electromagnetic radiation from radio waves to gamma rays and is an essential but limited communications resource that makes possible virtually every mission NASA undertakes. The SCaN Program manages the frequency bands allocated to NASA and ensures Agency activities comply with national and international laws. Without SCaN services, NASA could not receive data from its satellites and robotic missions or control the missions from Earth, relegating space hardware worth tens of billions of dollars to little more than orbiting debris.

In 2014, we began a series of audits examining each aspect of the SCaN Program. As of October 2016, we had issued three reports and opened a fourth audit examining NASA's management of its electromagnetic spectrum allocation. We plan to follow our spectrum review with a "capping report" on the overall SCaN Program.

Space Network

Our first SCaN audit, issued in April 2014, examined the Space Network.[51] At the time, NASA was upgrading the Space Network through the Space Network Ground Segment Sustainment (SGSS) Project with the goal of implementing a modern ground system that would enable delivery of high quality services while significantly reducing operations and maintenance costs. We found key components of the Network were not meeting planned cost, schedule, and performance goals, and that the delays and cost growth increased the risk the Network would be unable to continue to provide adequate communication services to NASA missions and its customers. At the time of our audit, NASA's baseline commitment for the SGSS Project was $862 million and the scheduled completion date June 2017. We found the Project could cost $329 million more than this amount and the schedule for completion could

[51] IG-14-018.

slip more than 18 months. Consistent with our finding, in June 2015 NASA's Agency Program Management Council approved a new Agency baseline commitment of $1.2 billion and a Project completion date of September 2019.

Deep Space Network

Our second audit in the SCaN series, issued in March 2015, focused on NASA's Deep Space Network.[52] Established in 1963 to provide communications for NASA robotic missions operating outside of Earth orbit, the Network also supports missions by foreign partners. During FY 2016, the Deep Space Network supported more than 30 missions, including insertion of the Juno spacecraft into orbit around Jupiter.[53] Because of its importance, NASA has designated the Network as NASA Critical Infrastructure.[54]

We found that although the Deep Space Network was meeting its current operational commitments, budget reductions had challenged the Network's ability to maintain these performance levels and threatened its future reliability. Specifically, in FY 2009 the Network implemented a plan to achieve $226.9 million in savings over 10 years and use most of those savings to build new antennas and transmitters. However, in FY 2013 the SCaN Program reduced the Network's budget by $101.3 million, causing management to delay upgrades, shutter antennas, and cancel or re-plan tasks. In FY 2016, SCaN officials again reduced the budget for the Network, which will further delay maintenance and upgrade tasks. We noted that if budget reductions continue, the Network faced an increased risk that it will be unable to meet future operational commitments or complete the upgrade project on schedule.

We also found significant deviation from Federal and Agency policies and procedures for ensuring the security of the Deep Space Network's IT and physical infrastructure. For example, the Network's system security categorization process did not consider all Network mission functions, vulnerability identification, and mitigation practices and the IT security configuration baseline application did not comply with Federal and Agency policy. Further, required physical security controls were missing or inconsistently implemented at the three complexes, procedures to assign security level designations did not comply with NASA policy, required facility security assessments had not been completed, and security waivers or other risk acceptance documentation were not consistently in place. Since issuance of our audit, NASA has completed a facility security assessment and is taking action to bring the three complexes into compliance.

Near Earth Network

Our third audit, issued in March 2016, focused on NASA's management of the Near Earth Network.[55] The Near Earth Network provides tracking, telemetry, and command services to approximately 40 Agency science missions operating in low Earth orbit, including the Soil Moisture Active Passive mission

[52] IG-15-013.

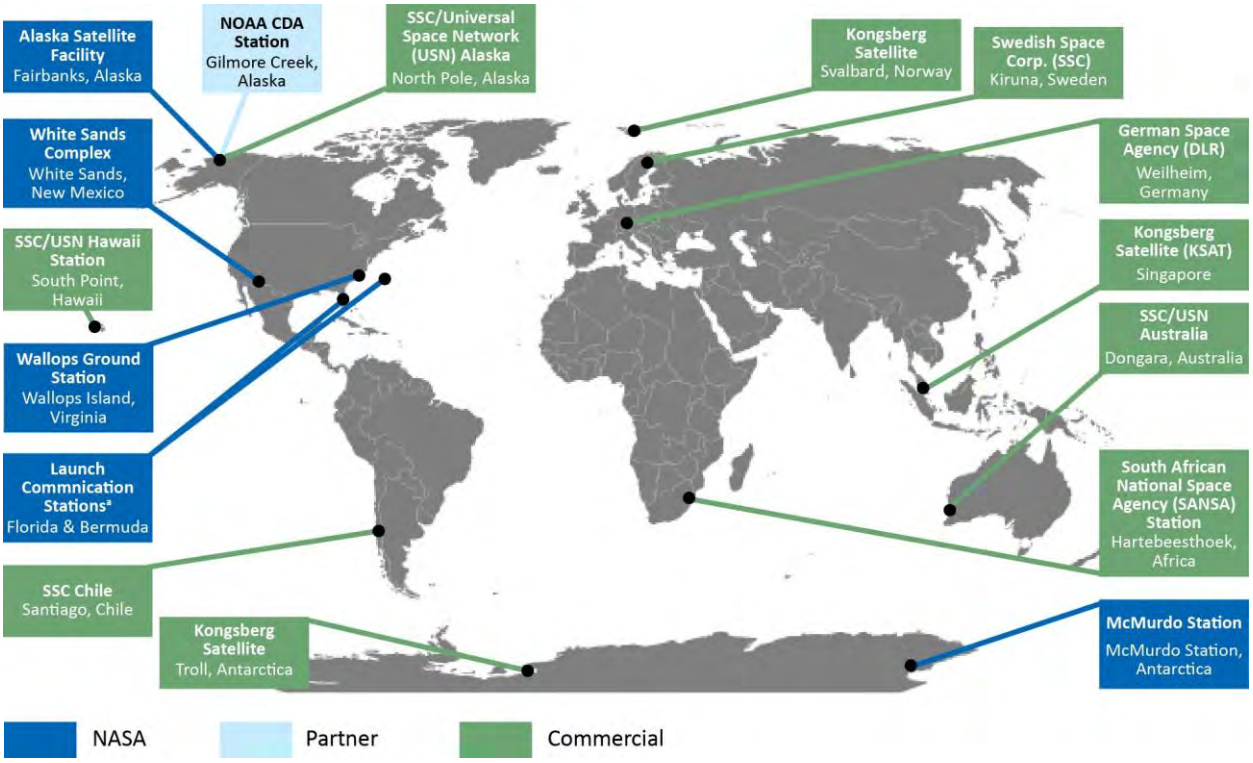
[53] Juno was launched in August 2011 with the principal goal of understanding the origin and evolution of Jupiter.

[54] NASA Critical Infrastructure are operations, functions, physical assets, or information technology resources essential to the success of the Agency's mission. NASA considers the Deep Space Network Critical Infrastructure because of its high public visibility, importance to the accomplishment of NASA missions, high-dollar value, and the difficulty of replacing the Network in a reasonable amount of time.

[55] NASA OIG, "NASA's Management of the Near Earth Network" (IG-16-014, March 17, 2016); "NASA's Management of the Deep Space Network" (IG-15-013, March 26, 2013); and "Space Communications and Navigation: NASA's Management of the Space Network" (IG-14-018, April 29, 2014).

launched in January 2015 and the Aura mission, which is still operating more than 10 years after its 2004 launch.[56] The Network also provides launch and contingency support for the National Oceanic and Atmospheric Administration satellites that provide weather forecasting for the United States and will be used to support the SLS and Orion in the initial stage of their journey to deep space. To provide these services, the Network uses NASA-owned antennas and transmitters located in Alaska, New Mexico, Virginia, and Antarctica, as well as equipment in other parts of the world owned by other U.S. or foreign government agencies or commercial entities (see Figure 2).

Figure 2: Locations from which NASA Obtains Communication Services



Source: NASA OIG.

Note: "NOAA CDA" refers to National Oceanic and Atmospheric Administration Command and Data Acquisition, which the Network uses for emergency contingency backup.

[a] Planned stations.

The Network's customers include NASA's Science, Human Exploration and Operations, and Space Technology Mission Directorates, as well as other Government agencies, foreign civilian space agencies, and commercial entities. Most of the missions the Network supported in 2016 were investigating various aspects of the Earth's atmosphere, hydrology, geography, geology, and ecology.

[56] The Soil Moisture Active Passive mission was designed to help scientists understand the links between Earth's water, energy, and carbon cycles and to enhance the ability to monitor and predict natural hazards like floods and droughts. Aura studies the chemistry of the Earth's atmosphere by taking measurements that enable scientist to research ozone trends and air quality changes and their linkage to climate change.

Using non-U.S. Government entities to transmit Agency data presents significant security challenges. Moreover, the NASA-owned Near Earth Network assets are aging and located in extreme environments, making maintenance difficult. Constrained budgets have also led the Agency to defer some maintenance activities, which, on at least one occasion, has contributed to the unexpected failure of Network equipment.

We found NASA deviated from elements of Federal and Agency cyber and physical security risk management policies, thereby increasing the Near Earth Network's susceptibility to compromise. Specifically, the Agency assigned a security categorization rating of "moderate" to the Network's IT systems and did not include the Network in its Critical Infrastructure Protection Program. We believe this categorization was based on flawed justifications and the Network's exclusion from the Protection Program resulted from a lack of coordination between Network stakeholders. Given the importance of the Network to the success of NASA Earth science missions, the launch and contingency support it provides for Federal partners, and its importance in supporting future human space flight, we recommended a higher categorization level and inclusion in the Protection Program.

We also found IT security controls like software that identifies malicious code are not in place or functioning as intended. Moreover, due to insufficient coordination between various NASA entities, physical security controls have not been implemented on Agency-owned and supporting contractor facilities in accordance with Agency or Federal standards.

Finally, Near Earth Network components are at risk of unexpected failure due to their age and lack of proactive maintenance. Although the Network was performing preventative maintenance on NASA-owned assets, it had not been proactively inspecting and replacing cables and mechanical systems that were reaching their failure point and had already caused one unexpected breakdown.

National Aeronautics and Space Administration

Office of the Administrator
Washington, DC 20546-0001

October 28, 2016

TO: Inspector General

FROM: Administrator

SUBJECT: Agency Response to Office of Inspector General Memorandum "NASA's 2016 Top Management and Performance Challenges"

The National Aeronautics and Space Administration (NASA) appreciates the opportunity to review and comment on the Office of Inspector General's (OIG) report entitled, "NASA's 2016 Top Management and Performance Challenges."

This report provides a valuable summation of the audit and investigative work performed by your office and underscores the importance of the work performed by the OIG. The report also provides valuable perspective and insight into the programs, projects, and activities that have been entrusted to NASA.

NASA continues to address its top management and performance challenges, as identified by the OIG, through the aggressive implementation of corrective actions associated with the underlying findings and recommendations which have been communicated to NASA in the various audit reports and investigative findings cited in your 2016 report.

Please find as an enclosure to this memorandum, NASA's response to the eight individual challenges outlined in your 2016 report.

If you have any questions regarding NASA's response to the 2016 Top Management and Performance Challenges, please contact Paul Roberts, Agency Audit Liaison on (202) 358-2260.

Charles F. Bolden, Jr.

Enclosure

MANAGEMENT'S RESPONSE
TO THE OFFICE OF INSPECTOR GENERAL'S REPORT ON
"NASA's 2016 TOP MANAGEMENT AND PERFORMANCE CHALLENGES"

Specific Management and Performance Challenges

1. Positioning NASA for Deep Space Exploration

NASA continues to make significant advances in the programs critical to achieving NASA's human exploration goals beyond low Earth orbit (LEO). The Space Launch System (SLS) Program has made solid progress in resolving several technical issues, maturing the design of the launch system, and building hardware. The Orion Program met several key development milestones on the path to Exploration Mission (EM)-2, and the Ground Systems Development and Operations (GSDO) program has made steady progress on the major equipment and facilities modernization initiatives needed to launch SLS and Orion.

Space Launch System

In response to the July 2016 Government Accountability Office (GAO) report, NASA Human Space Exploration: Opportunity Nears to Reassess Launch Vehicle and Ground Systems Cost and Schedule" (GAO-16-612), NASA noted that cost and schedule commitments for SLS and GSDO were established at each program's Key Decision Point C in 2014 and that schedules, costs, and margins to EM-1 were reviewed during each program's critical design review in 2015. NASA also noted that program performance was regularly monitored by a number of organizations (including the Agency technical authorities for engineering, safety and mission assurance, and health and medical, the Aerospace Safety Advisory Panel, NASA Advisory Council, directorate review boards, the Office of Inspector General, and the GAO).

NASA concurred with the GAO recommendation. NASA has incorporated plans to address the processes and capabilities in place to continue managing the enterprise within cost and schedule constraints, including available margins, as part of the build to synchronization review and that the SLS management agreement to EM-1 was being updated to align with program and enterprise execution plans.

In addition to regular monitoring processes, future planned life-cycle reviews (including those for design certification, systems integration, and flight readiness) will continue to assess cost and schedule reserves, and, if necessary, refine plans and schedules for EM-1.

Orion

In response to the Office of Inspector General (OIG) September 2016 audit report, "NASA's Management of the Orion Multi-Purpose Crew Vehicle Program" (IG-16-029), NASA noted that the Agency was implementing a complex development strategy for the Orion Program

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and appreciated that the OIG found the Orion Program risk management process to be effective in defining and mitigating the key risks with robust processes that also determine when residual risk is acceptable to the Agency.

NASA concurred with all of the OIG's recommendations. The Agency strategy of establishing launch windows for future flights strives to maintain maximum flexibility in program execution and always prioritizes crew safety highest among the program management objectives.

As the OIG noted, funding instability in terms of the overall budget amounts and the erratic timing of receipt of the annual appropriation make program management difficult. NASA evaluates program progress against the actual resource levels appropriated through the budget formulation and execution process. Through a series of design and programmatic reviews and status updates, NASA remains confident that the cost and schedule risk of the current approach is manageable since any element that achieves launch readiness before another is able to deploy resources on future flight build activities that would be expended in any event. It is important to note that human spaceflight requirements will pertain regardless.

NASA acknowledged that the current reserve depletion rate for Lockheed Martin is high and noted that the overall rate will adjust over the fiscal year. NASA has visibility into the allocations of management reserves within the prime contract. The reserves fall within the existing contract value and represent flexibility of the prime contractor to authorize previously undefined work within the contract scope without formal contract action or additional funding from the Government. The Orion Program has initiated a continuous assessment of contractor management reserves allocation and will report these results to the Program Manager monthly.

Ground Systems Development and Operations Program

In response to the OIG's March 2016 report, "Audit of the Spaceport Command and Control System" (IG-16-015), NASA noted the Agency has instigated a series of process improvements and that significant progress on the Spaceport Command and Control System (SCCS) software development effort has been made. NASA believes that the flexibility associated with a standards-based architecture has proven beneficial when the project needed to replace commercial-off-the-shelf (COTS) software products due to obsolescence, performance concerns, and/or vendor support concerns. Furthermore, NASA believes that it is important to continually evaluate the architecture, leverage COTS software applications as they evolve, and take full advantage of custom software that has been developed across all Agency programs.

NASA concurred with the OIG's recommendation. NASA had previously commissioned an independent team of industry experts from the Aerospace Corporation to assess the SCCS architecture in 2013; that assessment confirmed that the standards-based software architecture being implemented in SCCS is generally sound. NASA intends to conduct another independent assessment of command and control systems once the software for EM-1 is successfully delivered, focused on opportunities that can be implemented in time for the EM-2 flight of the SLS/Orion.

In summary, NASA takes feedback and recommendations from independent evaluators such as the OIG and GAO very seriously. NASA evaluates each recommendation carefully and works to implement improvements.

Management of Health and Human Performance Risks

The OIG's October 2015 report entitled "NASA's Efforts to Manage Health & Human Performance Risks for Space Exploration" (IG-16-003), represents a validation of NASA's Human Health and Performance framework and plans, and its recommendations will result in improvements to the implementation of this framework to support a future human mission to Mars. In response to the OIG report, Human Exploration and Operations Mission Directorate (HEOMD), Office of the Chief Health and Medical Officer (OCHMO), and Human Health and Performance Directorate (HHPD) have thoroughly addressed all six recommendations.

HEOMD, OCHMO, and HHPD have developed an integrated human health and performance risk-based management framework to enable the development of mitigation strategies for long-duration human space missions in and beyond LEO. These mitigation strategies require the integration of human health and performance, engineering, mission management, and policy disciplines to enable the safe conduct of human spaceflight missions and the protection of the long-term health of astronauts. HEOMD, OCHMO, and HHPD have worked diligently for the past decade to achieve an integrated approach to human health in space that incorporates the human system into spacecraft design and operations, following an occupational health model, as recommended by the National Academies. The Health and Medical Technical Authority has promulgated health standards and evidence-based risk management, which address integrated space health risks that drive spacecraft design as well as the Human Research Program's (HRP) R&D priorities and investments. Improvements to the NASA Human Health and Performance framework based on the six recommendations include the following:

- HEOMD will actively track and review HRP R&D investments by risk during the execution year to ensure that these costs are accurate so that HEOMD can be better informed on how funding challenges will impact the rate of countermeasure development.

- HRP implemented NASA best practices for project scheduling as well as the NASA Schedule Test and Assessment Tool for schedule logic analysis to ensure the Path-to-Risk Reduction schedule accurately reflects the status of research and realistic timeframes for countermeasure development to better determine what risks will be mitigated for the first human mission to Mars.

- HEOMD Associate Administrator established a System Maturation Team Lead for Crew Health and Performance to be the primary point of coordination within HEOMD to interface with all NASA programs, projects, and functions to ensure human health and performance issues have appropriate visibility.

- HEOMD Associate Administrator required the integration of all technical authorities (Safety & Mission Assurance, Engineering, and Health and Medical) on the Human

System Risk Board, Flight Activities Control Board, and HRP projects that move beyond technology readiness level 6.

- HEOMD Associate Administrator established a System Maturation Team (SMT) Lead for Crew Health and Performance to clarify the organizational technology development responsibilities for human system risk mitigation. The SMT will use experts on integrated product teams to develop and maintain the technical investment and development roadmaps.

- Chief Health and Medical Officer, in coordination with HEOMD and Legislative Affairs, submitted language to Congress to authorize NASA to provide long-term health care of astronauts. Congress is currently evaluating potential legislation.

2. Managing the International Space Station and the Commercial Cargo and Crew Programs

With the extension of the International Space Station (ISS) until at least 2024, NASA is able to continue its mission in LEO to: 1) extend human presence beyond LEO, and on to Mars; 2) conduct research to benefit humanity; 3) enable the development of a commercial market in LEO; and 4) provide the basis for continued U.S. leadership in exploration. All the ISS Partner agencies have approved ISS operations until at least 2024, except for the European Space Agency (ESA), which is expected to endorse operations until 2024, in the near future.

NASA, along with its International Partners, continues to safely operate and maintain the ISS platform based on the actual performance of the on-orbit vehicle. NASA performs regular assessments of the structure of the vehicle along with the many systems that allow humans to live and conduct research safely in space. NASA also has a rigorous operations, research, and technology development planning activity that begins with priorities from HEOMD management that are flowed down through the lowest levels of the program, both from a platform perspective and a research perspective. NASA has and will continue to balance the critical resources necessary to accomplish all of its goals, including crew time, upmass and downmass, communications, and other resources.

NASA is confident on the expected operations, maintenance, and transportation cost of the ISS Program. NASA has awarded firm fixed-price contracts for both crew and cargo transportation to ISS through 2024. These costs have been incorporated into the FY 2017 President's Budget Request. As a result, there are no major areas of cost uncertainty remaining, and the ISS program should not experience any additional cost growth beyond what has already been identified in the budget request.

Regarding managing human health and performance research and countermeasures, it is recognized by NASA crew health organizations that not all of the known risks to human spaceflight beyond LEO will be able to be mitigated fully. All the risks that can be mitigated with reasonable confidence will be addressed on the ISS during its lifetime.

Over the past year or more, the Center for Advancement of Science in Space (CASIS) has made tremendous progress in attracting, and maintaining, non-NASA research users in the private sector and with non-NASA Government agencies. For instance, the pharmaceutical industry is now a regular user of the ISS, and CASIS has made long term agreements to conduct research with other Government agencies such as the National Institute of Health and the National Science Foundation. It is NASA's opinion that CASIS is fulfilling its objectives to make available half of the NASA ISS resources to non-NASA users. NASA accepted the OIG's recommendation to develop performance metrics with CASIS to measure their performance. These metrics are now included in their quarterly reports and will be summarized in their annual report at the end of this calendar year.

Regarding NASA's evaluation of Commercial Crew Program hazards and variances, NASA agrees that disposition of hazards and variances must be done in a responsive fashion and we believe the Commercial Crew Program has an appropriate process in place for timely resolution. However, timeliness must be balanced with the need for thorough and accurate analysis of hazards. The quality of hazard reports will be critical to understanding the risks in the system and, ultimately, the safety of the crew. Variances and the logic and rationale behind the requests are critical to understanding if the design will be safe. This evaluation can be complex and may require NASA to perform unique analyses or tests. In addition, some hazard reports will require extended evaluation periods before approval for a number of reasons, many outside NASA's control. Strictly adhering to a timeline can yield to either accepting an inappropriate variance or disapproving a variance that could result in a more efficient, safer, or less costly operation in the future. The process of accepting variances and hazard reports is critical to developing a safe design. Timeliness must not be over stressed in this process.

3. Managing NASA's Science Portfolio

The Science Mission Directorate (SMD) develops and implements an extensive portfolio of scientific projects and programs that are inherently complex and present unique challenges. In developing its diverse science portfolio, NASA receives guidance from a variety of stakeholders including National Research Council, congress, the President and others. SMD strives to develop a balanced portfolio implementing the cutting-edge missions necessary to advance science and produce the incredible discoveries for which NASA has long been recognized. As we develop the unique missions and capabilities to explore space and advance understanding of Earth, NASA recognizes the need to be responsible stewards of taxpayers' dollars. This means delivering missions on cost and on schedule, consistent with the baselines that congress has approved.

NASA policy requires each project with a life-cycle cost estimated greater than $250 million to develop a joint cost and schedule confidence level (JCL) to inform the Decision Authority at Key Decision Point C (KDP-C). The JCL policy was adopted in January 2009, and among other things, includes all cost and schedule elements, incorporates and quantifies known risks, assesses the impacts of cost and schedule to date, and addresses available annual resources. NASA policy requires that projects be baselined and budgeted at the 70 percent confidence level, which is used to set the cost and schedule targets in the Agency baseline commitment, and funded at a level equivalent to at least the 50 percent confidence level, which is used to set the targets in the

project management agreement. This includes cost reserves held at the directorate and project level to address project risks.

The Science Plan for NASA's Science Mission Directorate outlined the Agency's efforts to revise and implement new policies to constrain mission costs and meet schedule goals. These noteworthy steps to reduce acquisition risk include requiring projects to develop a joint cost and schedule confidence level (JCL)—a tool which assigns a confidence level, or likelihood, of a project meeting its cost and schedule estimates and to improve the Agency's use of earned value management (EVM)—a tool designed to help project managers monitor risks.

NASA Science is dedicated to improving its acquisition management processes and performance. The 2018 Science plan, which is already under development, will update those policies as necessary.

We continue to make significant progress on major missions such as JWST, ICESat-2, and SOFIA. Indeed, during the most recent hearing before the House Science Committee, GAO in its testimony noted the JWST program held healthy cost and schedule reserves[1]. All sunshield membranes are complete and delivered to Northrop-Grumman for integration with other sunshield components. Nearly all of those other components are complete, and the remaining challenge associated with coatings on the membrane tensioning system is being addressed by remanufacturing the affected components. The budget and schedule needed to do so are well within the project's budget and schedule reserves. From the rebaseline in 2014 ICESat-2 made substantial, on-schedule progress in implementing and integrating the mission's key ATLAS instrument. SOFIA, a partnership with the German Aerospace Center (DLR), continues to produce excellent science results. NASA successfully implemented the ten recommendations issued by the OIG in its 2014 Audit Report, "SOFIA: NASA's Stratospheric Observatory for Infrared Astronomy" (IG-14-022).

The two NASA-led Science missions launched during the FY 2016, ASTRO-H and OSIRIS-REx, were both on schedule and well under budget (12 percent/$10M and 20 percent/$158M, respectively). Delay of the InSight mission from 2016 to 2018 has increased its development costs by an estimated 24 percent/$131M. In total, the actual cost of developing 12 SMD missions launched since 2012 has been 7 percent less than originally estimated. In addition, we also launched Jason-3 in January 2016–a partnership with the National Oceanographic and Atmospheric Administration (NOAA).

In short, NASA Science is providing reliable cost estimates for its missions, contributing to program stability and reducing risk.

NASA Science uses the vantage point of space to achieve with the science community and our partners a deep scientific understanding of our home planet, the Sun and its effects on the solar system, other planets and solar system bodies, the interplanetary environment, and the universe beyond. NASA Science is an outstanding investment for our Nation not only because we

[1] http://science.house.gov/sites/republicans.science.house.gov/files/documents/HHRG-114-SY16-WState-CChaplain-20150324.pdf

uncover new knowledge, but because we raise the bar of human achievement, inspiring the next generation of scientists and engineers.

4. Overhauling NASA's Information Technology Governance

NASA's Office of the Chief Information Officer (OCIO) has continued to address and implement significant improvements to NASA's Information Technology (IT) Governance. The recommendations associated with the OIG's June 2013 report were closed based on responsive management action in January 2016.

On March 31, 2016, the OIG initiated a follow-up audit to verify that the previously closed recommendations are fulfilling the intended changes. That audit is expected to be completed in May of 2017.

Over the last several years, NASA has transformed its IT governance structure to empower the CIO with greater authority, including by: 1) strengthening the CIO's role with program and mission IT decisions, with the CIO participating in major Agency decision-making processes for Agency missions; 2) increasing the CIO's responsibility, accountability and authority to drive efficiencies and cost-savings through the acquisition, deployment and management of IT across NASA; 3) ensuring that the IT security policies and procedures are implemented at NASA Centers, while realigning the reporting structure so that the NASA CIO has direct authority and oversight over Center CIOs; and 4) using a Solutions for Enterprise-wide Procurement tool to help manage a suite of Government-wide IT products to meet the requirements of FITARA.

To address the findings raised in the OIG's 2013 report, as well as ensure compliance with the Federal Information Technology Acquisition Reform Act (FITARA), NASA's first Business Service Assessment (BSA) was conducted for IT. NASA identified several actions related to IT Governance to strengthen visibility and enable a stronger approval process for all NASA IT spending. A new IT Council (ITC) is chartered and senior-leader members include Associate Center Directors, Deputy Mission Directors, and Assistant Administrators of NASA's functional areas.

In May 2016, the ITC received the first Annual Capital Investment Review (ACIR) for IT. The ACIR, addressing all IT investments across NASA, was a key milestone in the overhauling of NASA's IT Governance as it addressed a direct finding, and FITARA legislation, that the NASA CIO should have insight into all IT across NASA.

In addition, the first Center Functional Review will be held in November 2016 and will address policy compliance, in-depth program reviews for communications, computing services, IT security, applications, and end user services, as well as look for opportunities for collaboration and efficiencies in IT across NASA's Centers.

5. Securing NASA's Information Technology Systems and Data

Advancing NASA's IT Security posture in response to the ever-growing threats and attack vectors remains a priority for the Agency. Significant threats include stolen identity credentials,

phishing, malware, and an aging IT infrastructure. Building upon the tools and capabilities already deployed, NASA is implementing an integrated approach through enhancements to continuous monitoring and mitigation, network intrusion detection and prevention, data loss detection and prevention, and Personal Identity Verification (PIV) based authentication and developing a risk-based process to inform decisions at all levels.

In FY 2016, NASA made several enhancements to its security posture. First, we significantly improved our intrusion detection systems (IDS) which is strengthening our active security posture. Second, using the Department of Homeland Security's (DHS) Cyber Hygiene Report has greatly reduced critical- and high-vulnerabilities on internet facing systems. We also have begun to address medium and low findings from this same report. Third, we deployed IT and Domain Name Service sinkhole services that allow NASA the capability to redirect malicious attacks from known IP address ranges. Fourth, we enhanced our collaboration with our interagency partners to leverage their lessons learned and best practices; we also did this with the private sector community. Lastly, we incorporated intelligence from across the ".gov" domain into our risk matrices to improve our response and security posture.

Priority actions in fiscal year 2017 include: 1) implement a risk management framework informed by intelligence and operations to improve our security posture and decision-making; 2) pursue full compliance with DHS' Continuous Diagnostics & Mitigation (CDM) enterprise services; 3) focus on mitigating compromise of users via credentials by moving toward greater compliance with Homeland Security Presidential Directive-12; 4) fully deploy the DHS Automated Indicator Sharing program; 5) enhance Security Operations Center capabilities including Continuity of Operations, high availability and disaster recovery; 6) improve Federal Information Security Management Act compliance in the area of hardware and software management; 7) fully deploy DHS's EINSTEIN 3 Accelerated program capability in NASA; 8) deploy capability to work with missions to mitigate cybersecurity risks; 9) develop and train our IT workforce throughout NASA; 10) improve Center security reviews which will enhance the overall NASA security posture; and 11) focus on upgrading and decommissioning obsolete hardware and software. When taken in their totality these priorities will mitigate Agency risk and position NASA to better defend and monitor its networks.

We continue to work toward addressing all OIG recommendations and welcome their support in our work to maintain the security of all NASA's information assets.

6. Addressing NASA's Aging Infrastructure and Facilities

NASA recognizes the disparity between the infrastructure needs to support NASA's missions and the cost to maintain that infrastructure. As NASA's facilities age, reliability decreases and urgent, unscheduled repairs increase. NASA monitors unscheduled maintenance levels to identify problem areas and trends and to adjust maintenance strategies and investments to mitigate the greatest mission risks. NASA has been investing in remote sensing and assessment technologies as a method of improving the reliability of systems while simultaneously reducing the number of labor hours required to maintain critical systems. In some early investments, NASA saw a less than one-year return on investment. Recent NASA studies indicate that expanding investments in this area will continue to provide benefits to quality and cost of

maintenance. NASA will continue to invest in remote sensing technology to improve reliability and reduce operating costs for critical facilities systems.

To reduce infrastructure, NASA will continue its demolition program to demolish facilities that NASA no longer needs. NASA has made several changes to the demolition program this year. The demolition program was expanded to an integrated, cross-agency disposal program as part of its implementation of the "Reduce the Footprint" initiative. This has created a five-year disposal plan that includes Agency reduction goals. In fiscal year 2016, NASA exceeded its reduction goals. NASA will continue to use directed studies to identify excess or redundant infrastructure and develop disposal recommendations. Also in fiscal year 2016, NASA incorporated the disposal recommendations of a space environments testing study into its integrated disposal plan; setting disposal/demolition schedules for all of the disposal recommendations. NASA established a process requiring Mission Support Council review of proposals to remove major facilities from the disposal program. The process requires review by all major stakeholders of any proposal to retain a facility that previously was determined to be excess. Finally, during fiscal year 2016, NASA implemented a new office space standard: establishing a maximum allowable space for administrative space. This standard will result in denser, more efficient administrative facilities as NASA facilities are replaced or renovated.

NASA will continue its strategy of renovating or replacing old, unreliable and costly buildings to create a more efficient, sustainable infrastructure. NASA now has 2.9 million square feet of sustainable buildings, adding two buildings in fiscal year 2016 with an additional seven expected to come on line in fiscal year 2017. These buildings help NASA reduce its operating costs for its infrastructure through improved energy efficiency and a reduced repair demand.

7. Ensuring the Integrity of NASA's Contracting and Grants Processes

NASA's Office of Procurement appreciates the investigative and audit work cited by the OIG and acknowledges the importance of this effort, particularly where fraud is uncovered and process improvements can be made.

NASA continues to strengthen and improve contracting and grants processes throughout the Agency. NASA continues to strengthen its award-fee process through training and the issuance of additional NASA Federal Acquisition Regulation (FAR) Supplement (NFS) policy guidance relative to the award-fee process. We believe NASA's approach to award fee is sound and compliant with the FAR and related statute. We continue to strengthen the management of grants through our issuance of revisions to the NASA Grant and Cooperative Agreement Manual as well as updates to our financial assistance forms, which ensured compliance with section 200.210 (Information Contained in a Federal Award) of 2 CFR 200, Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards. Furthermore, where fraud is suspected and uncovered in contracts and grants, NASA remains dedicated to ensuring and monitoring the coordination of criminal, civil, contractual, and administrative (suspension and debarment) fraud remedies through the Agency's Office of the General Counsel, Acquisition Integrity Program (NASA AIP). NASA's AIP is a comprehensive coordination of fraud remedies program, which handles such matters in coordination with the Department of

Justice, pertinent law enforcement agencies including the NASA Office of Inspector General, other Federal agencies, and other NASA stakeholders including the Office of Procurement.

8. Ensuring the Continued Efficacy of the Space Communications Networks

Space Network

The findings relating to the Space Network and the Space Network Ground Segment Sustainment identified in the OIG's April 2014 report, "Audit of the Space Network's Physical and Information Technology Security Risks" (IG-14-026), have been addressed by defining a new baseline and implementation approach for SGSS.

Deep Space Network (DSN) Sustainment

Regarding the OIG's statement that, "*We noted that if budget reductions continue, the Network faced an increased risk that it will be unable to meet future operational commitments or complete the upgrade project on schedule*," NASA/JPL performed a thorough risk assessment of sustainment and obsolescence tasks. This resulted in a prioritization of activities that would be stretched out/delayed. This is a useful management tool to deal with a limited funding environment for projects that are more level of effort and where extending the schedule will not dramatically increase overall long-term costs. As risk increases to unacceptable levels, action is taken. These funding reductions have never affected the day-to-day operations and maintenance of the DSN and operations proficiency remains above required levels.

Near Earth Network (NEN) IT Security

The NEN has been coordinating and working with the Space Communication and Navigation (SCaN) program, the Office of Protective Services (OPS), and the Information Technology and Communications Directorate at Goddard Space Flight Center (GSFC) to address the concerns identified in the OIG's report. A thorough assessment is to be completed in fiscal year 2017 and will be used by SCaN to guide appropriate actions in coordination with these organizations. The NEN has also added a procedure to include NASA Security Operations Center incident reporting into NEN discrepancy-reporting procedures. SCaN has moved quickly to hire on contract an IT security specialist whose job will be to provide IT integrity across all of our networks, coordinating across NASA, and serve as single point of contact (POC) at the Program level for all such issues and concerns.

NEN Infrastructure Maintenance

The NEN has performed a thorough assessment of assets and scheduled depot-level maintenance on their antenna resources. The SCaN program is reviewing and prioritizing maintenance activities based on available resources.

FY 2016 Inspector General Act Amendments Report

Background

The Inspector General Act Amendments of 1988 (P.L. 100-504), require that heads of Federal agencies submit semi-annual reports to Congress on the actions taken in response to Office of Inspector General (OIG) audit reports. Specifically, agency heads are required to report on:

a) OIG reports containing monetary benefits (i.e., questioned costs or funds to be put to better use) for which:

- final management decisions were made during the reporting period;
- final management decisions have been made, but final management action is still pending;
- final management action was taken during the reporting period;
- no final management action was taken during the reporting period

b) OIG recommendations pending final management action more than one year after the issuance of the corresponding audit report.

Additionally, the Office of Management and Budget (OMB) outlines specific "action requirements" to Federal agencies through their Circular No. A-50, "Audit Follow-up." These requirements include that Federal agencies ensure final management decisions on OIG audit recommendations are reached within six months after the issuance of an audit report and that corresponding corrective actions begin as soon as practicable.

Finally, the Reports Consolidation Act of 2000 (P.L. 106-531), provides Federal agencies with the flexibility to annualize and consolidate semi-annual reports, such as this one, into the annual Agency Financial Report (AFR).

The following definitions are provided for the purpose of enhancing the readability and utility of NASA's FY 2016 reporting under the Inspector General Act Amendments of 1988:

Corrective Action consists of management's planned or proposed remediation efforts intended to mitigate an audit finding.

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

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

Final Management Decision is reached when management evaluates the OIG's findings and recommendations, and determines whether or not to implement a proposed recommendation.

Funds to be Put to Better Use (FPTBU) are potential cost savings, identified by the OIG that could be realized through the implementation of an audit recommendation.

Questioned Costs are those identified by the OIG as being potentially unallowable because of either: a) a purported violation of law, regula-

tion, 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.

Resolution: The point at which NASA and the OIG agree on action(s) to be taken in response to an audit recommendation or, in the event of disagreement, the point at which the Audit Follow-up Official determines the matter to be resolved.

NASA's Audit Follow-up Program

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. To this end, 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's audit follow-up program is a key element in improving the overall efficiency and effectiveness of NASA's programs, projects and operations.

NASA's Mission Support Directorate (MSD) is designated as the Agency's office of primary responsibility for policy formulation, oversight, and functional leadership of NASA's audit follow-up program. MSD implements audit follow-up program activities through an Agency-wide network of Audit Liaison Representatives (ALRs) who, in turn, are responsible for executing audit follow-up program activities at the Mission Directorate, Field Center and Headquarters Office levels. In conjunction with NASA's network of ALRs, MSD provides the infrastructure to support NASA's audit follow-up program. The program utilizes NASA's Audit and Assurance Information Reporting System (AAIRS) to track and monitor OIG audit reports and corresponding recommendations, as well as to support internal and external reporting.

In accordance with requirements outlined in OMB Circular A-50, MSD 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 is reached when either: a) management agrees to implement corrective actions in response to an OIG audit recommendation, or; b) management determines that implementing a particular audit recommendation is imprudent, impractical, not cost beneficial, etc. In those instances where a final management decision cannot be reached, resolution is achieved in conjunction with NASA's Audit Follow-up Official (AFO), consistent with provisions of OMB Circular A-50.

When a final management decision has been made to implement an audit recommendation, corrective action is pursued as rapidly as practicable. In some instances, the corrective action associated with a final management decision may span multiple fiscal years due to factors such as the complexity or cost of the planned corrective action; or unexpected delays in the formulation, review and approval of NASA policies, procedural requirements, or regulations. In these instances, MSD works with the OIG and respective Mission Directorate, Field Center, or Headquarters Office to ensure communication and coordination regarding necessary revisions to timelines and milestones associated with the implementation of these recommendations.

FY 2016 Audit Follow-up Results

The Inspector General Act Amendments of 1988 require that heads of Federal agencies report on corrective actions taken, or remain to be taken in response to OIG audit reports containing monetary benefits. For the purposes of this report, monetary benefits consist of Questioned Costs or Funds Put to Better Use (FPTBU), as defined above. The IG Act amendments also require that management report on those OIG recommendations for which a final management decision had been made in a prior fiscal year, but final management action is still ongoing.

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 FY 2016 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 Benefits:

In FY 2016, the OIG issued two audit reports[1] to NASA containing monetary benefits consisting of $787,640 in questioned costs which required final management action by NASA. In addition, $108,832,767 in total monetary benefits identified by the OIG in six audit reports[2] issued in prior fiscal years (FY 2012, FY 2014 and FY 2015) required final management action at the beginning of FY 2016. Consequently, during FY 2016 final management action was pending with regard to $109,620,407 in OIG identified monetary benefits (see Table 1).

During the course of FY 2016, final management action by NASA was taken with respect to $105,204,181 of current and prior year OIG identified monetary benefits. Specifically, final management action was completed regarding $2,151,161 and $103,053,020, of questioned costs and FPTBU, respectively.

As of September 30, 2016, final management action remains outstanding regarding $4,416,226 in OIG identified monetary benefits.

[1] "Audit of a NASA Space Grant Awarded to the University of Texas at Austin" (IG-16-013; February 18, 2016); and "Audit of NASA's Engineering Services Contract at Kennedy Space Center" (IG-16-017; May 5, 2016).

[2] "Audit of NASA Grants Awarded to the Philadelphia College Opportunity Resources for Education" (IG-12-018; July 26, 2012); "NASA's Independent Verification and Validation Program" (IG-14-024; July 16, 2014); "Audit of NASA's Cooperative Agreement with the City of New Orleans" (IG-15-018; June 29, 2015); "Audit of NASA's Management of the International Space Station Operations and Maintenance Contracts" (IG-15-021; July 15, 2015); "Audit of NASA's Cooperative Agreements Awarded to Wise County Circuit Court" (IG-15-022; July 16, 2015); and "NASA's Response to Orbital's October 2014 Launch Failure: Impacts on Commercial Resupply of the International Space Station" (IG-15-023; September 17, 2015).

Audit Reports with Monetary Benefits (Questioned Costs and Funds Put to Better Use) For the Year Ended September 30, 2016						
	Category	Questioned Costs		Funds to be Put To Better Use		Total Monetary Benefits (Dollars)
		Number of Reports	(Dollars)	Number of Reports	(Dollars)	
Line 1	Beginning Balance: Audit reports with monetary benefits issued in prior years (FY 2012, FY 2014 & FY 2015) requiring final management action (prior year carry-over into FY 2016)	6	$5,779,747	3	$103,053,020	$108,832,767
Line 2	Plus: Audit reports with monetary benefits issued during FY 2016 requiring final management action	2	$787,640	0	$0	$787,640
Line 3	Total audit reports with monetary benefits requiring final management action during FY 2016 [line 1 + 2]	8	$6,567,387	3	$103,053,020	$109,620,407
Line 4	Less: Audit reports with monetary benefits on which final management action was taken during FY 2016	6	$2,151,161	3	$103,053,020	$105,204,181
Line 5	Ending Balance: Audit reports with monetary benefits awaiting final management action at the end of FY 2016 [line 3 - line 4] (carry-over into FY 2017)	2	$4,416,226	0	$0	$4,416,226

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

As of September 30, 2016, a total of 63 recommendations in 20 OIG audit reports remain open, pending completion of final management action more than one year since the issuance of the corresponding final audit reports (see Table 2).

Although these 63 recommendations remain open more than one year after issuance of the respective audit reports, NASA management continues to aggressively pursue agreed-upon corrective actions intended to fully implement the OIG's recommendations. In summarizing these 63 open, prior year recommendations, the following four broad categories of the nature of outstanding corrective actions were identified:

1) Policy Development/Revision (49 percent);
2) Oversight/Monitoring/Program Review (29 percent);
3) Remedy Questioned Costs (11 percent);
4) Program/Project Operations (11 percent)

By way of comparison and perspective, as of September 30, 2015, a total of 56 recommendations in 19 OIG audit reports were open, pending completion of final management action, more than one year since the issuance of the corresponding final audit reports. During the five-year period ended September 30, 2016, the number of OIG audit recommendations open more than one year after report issuance has ranged between 38 and 63.

OIG Audit Reports Pending Final Management Action
One Year or More After Issuance of a Final Report
(As of September 30, 2016)

Report No. (Report Date)	Report Title	No. of Recommendations		
		Open	Closed	Total
IG12013 (03/01/2012)	*Audit of NASA's Process for Transferring Technology to the Government and Private Sector*	3	4	7
IG12017 (08/07/2012)	*Review of NASA's Computer Security Incident Detection and Handling Capability*	2	1	3
IG12018 (07/26/2012)	*Audit of NASA Grants Awarded to the Philadelphia College Opportunity Resources for Education*	3	5	8
IG13008 (02/12/2013)	*NASA's Efforts to Reduce Unneeded Infrastructure and Facilities*	2	3	5
IG14003 (11/19/2013)	*NASA's Use of Award Fee Contracts*	2	13	15
IG14015 (02/27/2014)	*NASA's Management of its Smartphones, Tablets, and Other Mobile Devices*	1	1	2
IG14020 (06/05/2014)	*NASA's Use of Space Act Agreements*	3	4	7
IG14023 (07/10/2014)	*Security of NASA's Publicly Accessible Web Applications*	2	3	5
IG14026 (07/22/2014)	*Audit of the Space Network's Physical and Information Technology Security Risks*	2	2	4
IG14031 (09/18/2014)	*Extending the Operational Life of the International Space Station Until 2024*	2	1	3
IG15002 (10/21/2014)	*Audit of NASA's Premium Air Travel*	1	6	7
IG15008 (11/24/2014)	*FY 2014 Financial Statement Audit Management Letter, prepared by PwC*	1	84	85
IG15009 (12/16/2014)	*NASA's Use of Blanket Purchase Agreements*	4	4	8
IG15013 (03/26/2015)	*NASA's Management of the Deep Space Network*	7	5	12
IG15014 (04/23/2015)	*Audit of NASA's Requirements for Plum Brook Station*	2	0	2
IG15015 (05/15/2015)	NASA's Compliance with the Improper Payments Information Act for Fiscal Year 2014	6	4	10
IG15019 (06/30/2015)	Review of NASA's Pressure Vessels and Pressurized Systems Program	6	4	10
IG15022 (07/16/2015	Audit of NASA's Cooperative Agreements Awarded to Wise County Circuit Court	5	2	7
IG15023 (09/17/2015)	NASA's Response to Orbital's October 2014 Launch Failure: Impacts on Commercial Resupply of the International Space Station	2	5	7
IG15024 (09/29/2015)	Audit of NASA's Joint Cost and Schedule Confidence Level Process	7	1	8
20	**Totals**	**63**	**152**	**215**

3. Final Management Decisions Made Within Six Months of Report Date

During FY 2016, the OIG issued 19 audit reports containing 136 recommendations addressed to NASA which required a final management decision within six months of the respective final report dates. Final management decisions were made within six months of issuance of the corresponding final audit reports on 132 (97 percent) of the OIG recommendations issued during FY 2016. Final management decisions on the remaining four recommendations contained in three OIG audit reports[3] issued in FY 2016 remain unresolved (final management decisions are pending) as of September 30, 2016. Resolution activities intended to achieve a final management decision between NASA and the OIG on these four unresolved audit recommendations are ongoing.

In addition to the 136 OIG recommendations that were issued to NASA and resolved during FY 2016, final management decisions were made on two prior year (FY 2015) recommendations in two OIG audit reports[4] within six months of the respective final report dates.

For the five-year period ended September 30, 2016, the OIG issued 829 audit recommendations in 89 reports requiring a final management decision within six months of the respective final report dates. Final management decisions were made within six months of the respective final reports dates on 98 percent of these recommendations.

4. Audit Recommendation Closure Efficiency

During FY 2016, a total of 172 OIG audit recommendations (including 158 recommendations issued in prior years) were closed based on responsive management action taken by NASA. Of the 172 recommendations closed by the OIG during FY 2016:

- 33 recommendations (19 percent) were closed within one year after issuance of the associated audit report;
- 127 recommendations (74 percent) were closed between one and two years after issuance of the associated audit report
- 12 recommendations (7 percent) were closed in excess of two years after issuance of the associated audit report

[3] "NASA's Compliance with the Improper Payments Information Act for Fiscal Year 2015" (IG-16-021; May 12, 2016); "NASA's Response to SpaceX's June 2015 Launch Failure: Impacts on Commercial Resupply of the International Space Station" (IG-16-025; June 28, 2016); and "NASA's Commercial Crew Program: Update on Development and Certification Efforts" (IG-16-028; September 1, 2016).

[4] "Audit of NASA's Management of International Space Station Operations and Maintenance Contracts" (IG-15-021; July 15, 2015); and "NASA's Response to Orbital's October 2014 Launch Failure: Impacts on Commercial Resupply of the International Space Station" (IG-15-023; September 17, 2015)

For comparative purposes, during FY 2015 a total of 176 OIG audit recommendations (including 154 recommendations issued in prior years), were closed based on responsive management action, with:

- 121 recommendations (69 percent) closed within one year after issuance of the respective audit reports;
- 29 recommendations (16 percent) closed between one and two years after issuance of the respective audit reports; and
- 26 recommendations (15 percent) closed in excess of two years after issuance of the respective audit reports.

For the five-year period ended September 30, 2016, an average of 44 percent of OIG audit recommendations were closed within one year of issuance of the respective audit reports; 46 percent were closed within two years after issuance of the respective audit reports, and 10 percent were closed in excess of two years after issuance of the respective audit reports.

Improper Payments Information Act (IPIA) Assessment

The Improper Payment Information Act of 2002 (IPIA) (Public Law (P.L.) 107-300) requires Federal agencies to review their programs and activities for improper payments, identify programs and activities subject to significant risk of improper payments, generate an annual estimate of improper payments for susceptible programs and activities, and report the results of improper payment activities to Congress. IPIA aims to detect and prevent improper payments made by Federal government agencies in order to verify that taxpayer dollars are spent properly and efficiently. Since its inception, executive agency responsibilities for improper payments have expanded and evolved in order to further reduce fraud, waste, abuse and misuse of Government funds. Throughout this evolution, the National Aeronautics and Space Administration (NASA) has remained committed to preventing and reducing fraud, waste and abuse through its Improper Payments Program.

In order to increase transparency and accountability for executive agencies disbursing government funds and taxpayer dollars, the President issued Executive Order 13520, Reducing Improper Payments (November 20, 2009). This executive order aimed to reduce improper payments by intensifying efforts to eliminate payment error, waste, fraud and abuse within the major programs administered by the Federal Government.[1] In 2010, the President also took action to enact the Memorandum on Enhancing Payment Accuracy through a "Do Not Pay List." This Presidential action introduced the "Do Not Pay" initiative. In order to amend the IPIA and prevent further loss of taxpayer dollars, Congress also enacted the Improper Payments Elimination and Recovery Act of 2010 (IPERA) (P.L. 111-204). IPERA, as compared to IPIA, expanded the scope and level of detail required for improper payment reporting amongst executive agencies. It also introduced the OMB risk factors contributing to program susceptibility to significant improper payments and repealed the Recovery Auditing Act (Section 831, Defense Authorization Act, for FY 2002; P.L. 107-107) by adding requirements for executive agencies to report on the actions taken to recover improper payments.

On January 10, 2013, the President signed into law the Improper Payments Elimination and Recovery Improvement Act of 2012 (IPERIA) (P.L. 112-248), further amending IPIA and IPERA. As designed, IPERIA was intended to strengthen and intensify efforts to identify, prevent, and recover payment error, waste, fraud and abuse with Federal spending.[2] The law aimed to improve upon agency efforts to identify and estimate improper payments, further develop improper payment recovery efforts, and support "Do Not Pay" efforts as introduced by the President. To provide implementation guidance in executing the legislative principles of IPIA, IPERA and IPERIA, the Office of Management and Budget issued Memorandum M-13-20, Protecting Privacy while Reducing Improper Payments with the Do Not Pay Initiative in 2013 and Memorandum M-15-02, Requirements for the Effective Estimation and Remediation of Improper Payment in 2014. Memorandum M-15-02 modified both OMB Memorandum M-11-16 (Circular A-123 Appendix C Parts I and II) and

[1] Executive Order 13520 of November 20, 2009, Reducing Improper Payments

[2] Improper Payments Elimination and Recovery Improvement Act of 2012 (IPERIA) (P.L. 112-248)

OMB Memorandum M-10-13 (Circular A-123, Appendix C Part III) and changed the framework of improper payment compliance. In addition to modifying the requirements of OMB Circular A-123, Appendix C, Parts I and II, it also consolidated and implemented the requirements of the following:

- IPIA (P.L. No. 107-300), as amended;
- IPERA (P.L. No. 111-204);
- IPERIA (P.L. No. 112-248); and
- Executive Order 13520 – Reducing Improper Payments – issued November 20, 2009.

In 2013, The President ratified additional improper payment legislation via the Disaster Relief Appropriations Act (Disaster Relief Act). The Act, as signed by the President, provided $50.5 billion in aid for Hurricane Sandy disaster victims and their communities and detailed additional requirements for agencies receiving Hurricane Sandy appropriations. Furthermore, implementation guidance for the principles presented in the Disaster Relief Act was passed within OMB Memorandum M-13-07, Accountability for Funds Provided by the Disaster Relief Appropriations Act. As noted in OMB Memorandum 13-07, section 904(b) of the Disaster Relief Act, one of these requirements provides that all programs and activities receiving funds under the Act shall be deemed to be "susceptible to significant improper payments" for the purposes of the Improper Payment assessment.

Under the parameters set forth in IPIA, IPERA, and IPERIA, agencies are required to perform a risk assessment of its programs and activities, identify programs and activities that are susceptible to a high risk of significant improper payments, estimate annual improper payments for susceptible programs and activities, and report the result to Congress. Throughout the last decade, NASA has worked to meet all requirements for compliance with IPIA.

As specified by OMB Circular A-123, Appendix C, NASA performed the FY 2016 improper payment risk assessment on FY 2015 payments. NASA evaluated its 89 programs using the OMB qualitative risk factors detailed in Circular A-123, Appendix C, as well as additional quantitative factors. As a result, NASA determined that none of its 89 Agency programs were susceptible to a high risk of significant improper payments.

During FY 2015, Disaster Relief Act payments totaling $9.26 million were made under the Hurricane Sandy project, as part of the Institutional Construction of Facilities (CoF) program. As required by the Disaster Relief Act and IPIA, NASA selected a statistically valid sample of Hurricane Sandy payments, reviewed the sampled disbursements for improper payments, and produced an estimate of improper payments in that program. After completing the improper payment review in accordance with Circular A-123, Appendix C, no improper payments were identified. Although the result of improper payment testing did not uncover any improper payments, NASA will remain dedicated to reviewing its programs, monitoring its payments and payment processes, and formulating corrective actions, if deemed necessary.

Improper Payments Information Act Reporting Details

For FY 2016 and prior years, NASA used its Improper Payment Risk Assessment methodology to evaluate its programs for susceptibility to improper payments. As required by IPIA; IPERA; IPERIA; Executive Order 13520; OMB Circular A-123, Appendix C; and OMB A-136, NASA presents the financial reporting elements for the following improper payment activities:

- Improper Payment Risk Assessment
- Statistical Sampling
- Improper Payment Reporting
- Improper Payment Root Cause Categories
- Corrective Actions and Barriers
- Internal Control over Payments
- Accountability, Agency Information Systems and Other Infrastructure
- Recapture of Improper Payments Reporting

Improper Payment Risk Assessment

NASA performed its FY 2016 Improper Payments Risk Assessment using its risk assessment methodology. This methodology incorporates seven (7) risk conditions, each with a static set of related criteria and is designed to account for eleven (11) separate risk factors. In order to implement recommendations made by the NASA OIG, changes to improper payment legislation, changes to NASA's operating environment, and other circumstances, NASA assesses and updates its Risk Assessment Methodology annually. During FY 2016, NASA assessed the FY 2015 Risk Assessment methodology and determined that no significant changes should be made to the procedures and criteria used to determine programs' susceptibility to a high risk of improper payments.

OMB requires that each agency assess the improper payment risk level for each program not reporting an improper payment estimate once every three years.[3] Although historically NASA has not identified improper payments or found programs to be susceptible to a high risk of improper payments, NASA takes a more conservative approach by assessing improper payment risk for all programs annually. In FY 2016, the Improper Payment Risk Assessment methodology was completed for all programs in two major phases: Identify NASA Programs and Assess Improper Payment Risk.

1. Identify NASA Programs

To develop a list of NASA programs eligible to be assessed for the FY 2016 Improper Payment Risk Assessment, NASA extracted the population ($18.24 billion) of FY 2015 disbursements from its financial management system. Once extracted, these disbursements were reviewed and 111 distinct programs were identified.

A review of the FY 2015 budget was performed and programs listed within the budget were compared to the 111 programs initially identified. Based on FY 2015 budgetary resources, materiality of disbursements, and the nature of program funding, several of the 111 programs were combined to reach a total of 89 distinct programs (as listed in Figure 1 below). The 89[4] programs were then assessed to

[3] OMB Circular A-136, Financial Reporting Requirements

[4] Initially 111 distinct programs were identified within NASA's financial management system, then further elected and consolidated to 89 based on the budget. Historically, programs in the Education mission were too insignificant to meet assessment materiality thresholds; therefore, the 7 programs were combined. For programs in the Institutions and Missions, funding differs from other functions; therefore, the 14 programs were combined. Last, historically within the budget, the Commercial Crew and Cargo programs have been combined into Commercial Spaceflight ageist; therefore, these programs were combine for the risk assessment as well.

determine their level of susceptibility to a high risk of improper payments. A list of programs assessed for risk in FY 2016 is shown in **Figure 1**. Once combined, the consolidated list of programs was confirmed by comparison to the budget.

Figure 1: Programs Assessed during the FY 2016 Improper Payment Risk Assessment*

FY 2016 Programs Assessed (89 Combined Programs)		
21st Century Space	Commercial Cargo & Crew	Exploration Systems Mission Directorate Institutional Reimbursable
Advanced Air Vehicles Program	Congressionally Directed Items	Exploration Systems Mission Directorate Reimbursable
Advanced Exploration Systems	Constellation System	Exploration Technology Development
Aeronautics Research Mission Directorate Institution Reimbursable	Cosmic Origins	Exploration Technology Development Program
Aeronautics Research Mission Directorate Reimbursable	Crosscutting Space Technology Development	Fundamental Aeronautics
Aeronautics Strategy and Management	Discovery	Gifts and Donations
Aeronautics Test	Earth Science Multi Mission Operations	Heliophysics Explorers Program
Agency IT Services	Earth Science Research	Heliophysics Research
Agency Management	Earth Science Technology Program	Human Research Program
Airspace Operations and Safety Program	Earth System Science Pathfinder	Human Space Flight Operations
Airspace Systems	Earth Systematic Missions	Independent Verification & Validation Reimbursable
Applied Science Program	Education	Innovative Partnership Program
Astrophysics Explorer	Education Programmatic Reimbursable	Institutional Construction of Facilities Cross Agency Support Programs
Astrophysics Research	Enhanced Use Lease	Institutional Construction of Facilities[5]
Aviation Safety	Enhanced Use Lease Cross Agency Support Programs	Institutions and Management
Canadian Atlantic Storm Programmatic Institution Program Reimbursable	Environmental Compliance and Restoration	Integrated Aviation Systems Program
Canadian Atlantic Storm Programmatic Program Reimbursable	Environmental Compliance and Restoration Cross Agency Support Programs	Integrated Systems Research
Center Management and Operations	Exoplanet Exploration	
	Exploration Construction of Facilities	
	Exploration Ground Systems	

[5] Under the requirements of OMB Memorandum M-13-07 (via the Disaster Relief Act) and in conjunction with the principles of OMB Circular A-123, Appendix C, the Hurricane Sandy project (within the Institutional Construction of Facilities Program) was designated as susceptible to a high risk of improper payments by OMB.

Figure 1: Programs Assessed during the FY 2016 Improper Payment Risk Assessment (cont.)

FY 2016 Programs Assessed (89 Combined Programs)		
International Space Station Program	Physics of the Cosmo	Small Business Innovative Research/Small Business Technology Transfer Resources
James Webb Space Telescope	Planetary Science Research Program	Solar Terrestrial Probes
Launch Services	Rocket Propulsion Testing	Space Communication and Navigation
Living with a Star	Safety and Mission Success	Space Launch System
Lunar Precursor Robotic Program	Science Construction of Facilities	Space Operations Construction of Facilities
Lunar Quest Program	Science Mission Directorate Institution Reimbursable	Space Shuttle Program
Mars Exploration	Science Mission Directorate Programmatic Reimbursable	Space Technology
National Historic Preservation	Science Operations Mission Directorate Institution Reimbursable	Strategic Capabilities Assets Program
New Frontiers	Science Operations Mission Directorate Programmatic Reimbursable	Technology
New Millennium	Science Technology Programmatic Reimbursable	Technology Maturation
Orion Multipurpose Crew Vehicle		Transformative Aeronautics Concepts Program
Outer Planets		
Partnerships, Innovation and Commercial Space & Strategic Integration		

* The program designations are in accordance with identification by budget line items and FY 2015 disbursements made under the listed program name which resulted in review during the FY 2016 risk assessment.

2. Assess Improper Payment Risk

NASA has designed a unique Risk Assessment Methodology which assesses static sets of criteria categorized by risk conditions. These risk conditions are intended to coincide with and are analyzed in conjunction with the nine (9) OMB risk factors detailed in Circular A-123, Appendix C, as well as two (2) additional risk factors integrated into the methodology by NASA. The following risk conditions and risk factors are assessed by NASA:

Risk Conditions

i. Internal Control Over Payment Processing
ii. Internal Monitoring and Assessments
iii. External Monitoring
iv. Human Capital
v. Program Profile
vi. Payment Profile
vii. Materiality of Disbursements

OMB Risk Factors

i. Whether the program or activity reviewed is new to the agency;
ii. The complexity of the program or activity reviewed, particularly with respect to determining correct payment amounts;
iii. The volume of payments made annually;
iv. Whether payments or payment eligibility decisions are made outside of the agency;
v. Recent major changes in program funding, authorities, practices, or procedures;
vi. The level, experience, and quality of training for personnel responsible for making program eligibility determinations or certifying that payments are accurate;
vii. Inherent risks of improper payments due to the nature of agency programs or operations;
viii. Significant deficiencies in the audit reports or the agency including, but not limited to, the agency Inspector General or the Government Accountability Office (GAO) audit report findings, or other relevant management findings that might hinder accurate payment certification; and
ix. Results from prior improper payment work.

Additional Risk Factors

x. Other risk susceptible programs determined by OMB on a case-by-case basis to be subject to annual PAR/AFR reporting; and
xi. Disaster Relief Appropriations Act – Hurricane Sandy.

In order to evaluate susceptibility of each program to improper payments, NASA reviewed various information and reports, conducted surveys, and executed various analyses related to NASA programs. In addition, two (2) separate Risk Assessment questionnaires were developed and distributed in order to address the 11 (eleven) risk factors included in the risk assessment. Specific information obtained and reviewed includes the following:

- FY 2015 and FY 2016 audit reports, findings, and recommendations (i.e. Reports for the OIG, GAO, and other independent bodies)
- FY 2013 - FY 2015 Circular A-123, Appendix A risk assessment and internal control review results
- Results of NASA internal reviews performed on FY 2015 payments
- NASA Budgetary Estimates and trends from FY 2011 – FY 2015
- FY 2015 Payment Processing and FY 2015 Hurricane Sandy Risk Assessment questionnaires
- Applicable OMB Memoranda
- FY 2014 and FY 2015 financial management reports
- FY 2014 and FY 2015 program disbursements
- FY 2015 Statement of Attestation Standards (SSAE) 16 Reports
- FY 2013, FY 2014, and FY 2015 IPIA compliance audit results

Using the information reviewed and the risk assessment criteria, each risk condition for each program was assigned a risk rating. NASA then calculated a weighted average risk rating for each program based on the risk scores and weights assigned to each risk condition. As a result of the FY 2016 Risk Assessment, none of the 89 NASA programs were considered to be susceptible to a high risk of significant improper payments. Under the requirements of Circular A-123, Appendix C, however, OMB has the authority to determine on a case-by-case basis that certain programs that do not meet susceptibility thresholds are still subject to reporting requirements in the AFR. By issuing OMB Memorandum 13-07 (as guidance to implementing the Disaster Relief Act), OMB exercised this ability by designating that all programs receiving funds under the Disaster Relief Appropriations Act shall be deemed susceptible to a high risk of significant improper payments. Accordingly, NASA proceeded to select a sample of Hurricane Sandy payments for improper payment testing.

High Risk Program Statistical Sampling

As the Hurricane Sandy project was deemed susceptible to a high risk of significant improper payments under OMB via M-13-07 (via the Disaster Relief Act), NASA selected a statistically valid sample of payments for testing. Disaster Relief funds appropriated and disbursed in FY 2015 totaled $9.26 million and were isolated to the Hurricane Sandy project within the Institutional Construction of Facilities (CoF) program. To prepare for sampling, NASA isolated and extracted the population of Hurricane Sandy payments from the population of FY 2015 disbursements made from October 1, 2014, to September 30, 2015 (FY 2015) then confirmed the population was complete. Using OMB guidance and the extracted Hurricane Sandy transactions, a statistically valid sample of Hurricane Sandy payments was selected.

After assessing the sampling approach used in FY 2015, and determining that the same approach would be used for FY 2016, NASA prepared a stratified, random sample to yield an estimate with a 90 percent confidence level and a margin of error plus or minus 1.5 percent. Of the 29 FY 2015 transactions made under the Hurricane Sandy project, totaling $9.26 million, 15 transactions totaling $8.97 million were randomly sampled. The sampling plan was developed to meet the minimum precision level established by OMB and is consistent with the sampling plan executed in FY 2015.

High Risk Program Improper Payment Reporting

NASA performed attribute-based improper payment testing of the FY 2015 Hurricane Sandy project transactions sampled and identified zero (0) improper payments/exceptions. Testing took place over a period spanning from March 2016 to May 2016.

In conjunction with the FY 2016 sampling methodology, NASA also developed a statistically valid extrapolation method in order to project sample findings over the entire population of payments. As a standard approach, NASA planned to use a stratified separate ratio estimator to extrapolate the total error rate to all FY 2015 transactions. As no improper payments were identified for the period spanning from October 1, 2014, to September 30, 2015, extrapolation resulted in $0.00 estimated improper payments and a 0.00% estimated improper payment percentage.

Table 1 presents the result of FY 2015 testing and extrapolation. As required by OMB Circular A-136, Financial Reporting Requirements, the table also presents the improper payment outlook for FY 2015 – FY 2018. Consistent with the results of testing, the table presents a $0.00 and 0.00% improper payment estimate for FYs 2014 – 2018, as no improper payments were identified in FY 2014 or 2015.

Improper Payment Reduction Outlook (A-136 Table 1)
(In Millions of Dollars)

Program	2014 Outlays	2014 IP%	2014 IP$	2015 Outlays	2015 IP%	2015 IP$	2015 Underpayment $	2015 Overpayment $	2016 Est. Outlays	2016 Est. IP%	2016 Est. IP$	2017 Est. Outlays	2017 Est. IP%	2017 Est. IP$	2018 Est. Outlays	2018 Est. IP%	2018 Est. IP$
Hurricane Sandy Disaster Relief Program – (CoF)	$4.98	0.00%	$0	$8.97	0.00%	$0	$0	$0	$1.05	0.00%	$0	$0	0.00%	$0	$0	0.00%	$0
Total	$4.98	0.00%	$0	$8.97	0.00%	$0	$0	$0	$1.05	0.00%	$0	$0	0.00%	$0	$0	0.00%	$0

∗ NASA performed its FY 2016 Risk Assessment on FY 2015 programs and disbursements. The figures presented as current year are FY 2015 transactions. Accordingly, amounts and estimates presented within this table represent transactions that occurred in the fiscal year prior to the year presented.

Improper Payment Root Cause Categories

OMB Circular A-123, Appendix C and OMB Circular A-136 both require agencies to categorize and present improper payments for all programs deemed susceptible to a high risk of significant improper payments by the 13 (thirteen) OMB-defined improper payment categories. NASA did not identify any programs with improper payments (overpayments or underpayments) during the FY 2016 Risk Assessment; therefore, no root causes are displayed.

Corrective Actions and Barriers

Given the results of improper payment testing and the fact that no improper payments were identified, NASA has elected not to develop a corrective action plan for FY 2016. NASA will continue to monitor and assess its payment processes and processing environment in order to minimize Agency vulnerability to improper payments. Should improper payments be identified, a root cause analysis will be performed and formulation of corrective actions will be considered.

Internal Controls over Payments

As the first line of defense against improper payments, NASA is dedicated to the establishment, maintenance, and ongoing assessment of robust internal control processes, especially over Agency payments. NASA will continue to apply the five (5) standards and attributes of internal control (Control Environment, Risk Assessment, Control Activities, Information and Communications, and Monitoring) to its programs and activities to reinforce the ability of the Agency internal control program to prevent, detect, and recover improper payments, if made. As NASA did not identify any programs with improper payments exceeding the statutory thresholds of OMB Circular A-123, Appendix C, during the FY 2016 Risk Assessment, reporting on internal controls over payments is not required.

Accountability, Agency Information Systems and Other Infrastructure

Although none of NASA's programs have improper payments exceeding the statutory thresholds outlined in OMB Circular A-123, Appendix B, NASA's management works diligently to hold Agency personnel and other stakeholders accountable for the prevention of improper payments and to verify the Agency has proper infrastructure, internal controls, and systems. Given no improper payments were identified, reporting on accountability, Agency information systems, and other infrastructure is not required.

Recapture Audit

On July 22, 2010, the President signed into Law the Improper Payment Elimination and Recovery Act (IPERA; Pub. L. No. 111-204). IPERA requires all Federal agencies to conduct payment recapture audits as part of its overall program to ensure effective internal controls over payments. NASA continues to perform recapture audits over fixed price contracts only as part of its overall program to ensure effective internal control over payments.

This approach is in accordance with the amended Office of Management and Budget (OMB) Circular A-123, Appendix C guidance, which allows agencies to make the determination to exclude classes of contracts payments from recapture audit activities if the agency determines that recapture audits are inappropriate or not a cost-effective method for identifying and recovering improper payments. Performing a separate recapture audit on these cost-type contracts would not be cost-effective as determined in prior years. NASA does not consider it cost-effective to conduct payment recapture audits for cost type contracts or grants and cooperative agreements as these payments are made through our centralized procure to pay process which provides reasonable assurance of proper payment. Additionally, OMB was notified of this decision in April 2007.

NASA attributes much of the positive results of its improper payment program to the centralized procurement and payment activities executed at the NASA Share Services Center. Centralized processing provides a sound internal control environment that mitigates the risk of improper payments across the Agency, as such, grants and cooperative agreements are not included as part of its recapture audit efforts.

In FY 2014, NASA awarded the contingency based Recapture Audit contract to an industry leading consulting firm. For FY 2016, the Recapture Audit scope entailed the review of FY 2015 disbursements to identify and recover overpayments, duplicate payments, erroneous payments, lost credit memos, and internal transaction errors of NASA's fixed price contracts. There were no overpayments recaptured through payment recapture audits.

In addition to the Recapture Audit activities described above, the Agency conducted activities outside of the FY 2016 Agency Recapture Audit. Examples of such activities include Agency post-payment review/audits, single audit, and self-reported overpayments.

Improper Payment Recaptures with and without Audit Programs (A136 Table 4)

(In Millions of Dollars)

	Overpayments Recaptured through Payment Recapture Audits							Overpayments Recaptured through Payment Recapture Audits	
	Contracts					Total			
Program or activity (Type of Payment)*	Amount Identified-FY15**	Amount Recaptured-FY15	CY Recapture Rate-FY15	CY + 1 Recapture Rate Target	CY + 2 Recapture Rate Target	Amount Identified-FY15	Amount Recaptured-FY15	Amount Identified-FY15	Amount Recaptured-FY15
Procurement	0.00	0.014	0%	0%	0%	0.00	0.00	6.437	4.347
Travel	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.125	0.100
Payroll	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.131	0.102
Other	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.242	0.005

* NASA's Recapture Audit is performed by payment type instead of by Program or Activity.

** NASA had no funds recaptured through the FY 2016 Recapture Audit (based on FY 2015 disbursements).

FY 2016 Disposition of Funds Recaptured Through Payment Recapture Audits (A136 Table 5)

Program or activity (Type of Payment)*	Amount Recaptured	Payment Recapture Auditor Fees	Original Purpose*	Office of Inspector General	Returned to Treasury
Procurement	**0.014**	**0.003**	**0.014**	**0.00**	**0.000**

* The original improper payment was identified in FY 2015; however, the collection occurred in FY 2016.

NASA has taken steps through Improper Payment Reviews and recapture audits to continue efforts already embedded in the control environment 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 payments. There are no statutory or regulatory barriers limiting NASA's ability to reduce improper payments.

Do Not Pay Initiative

The Office of Management and Budget (OMB) issued Memorandum M-12-11 dated April 12, 2012, *Reducing Improper Payments through the "Do Not Pay List"* requiring agencies to submit a "Do Not Pay (DNP) List" Implementation Plan to OMB by August 31, 2012.

NASA fully integrated into the Treasury's DNP portal process on September 27, 2014, utilizing the following data sources: the Social Security Administration Death Master File (SSA-DMF) and the System for Award Management Excluded Parties List System (SAM-EPLS).

The cumulative results of these monthly reviews reported in Table 7 are for the period of October 2015 through August 31, 2016. The data reported for September is pending adjudication results with actuals available after November 2016. During this time period, there were 126,267 payments made by Treasury on behalf of NASA with a dollar value of $13.864 billion. Treasury uses only the vendor name in SAM to identify any matches for potential improper payments. NASA researches any identified matches, validating the data using the Tax Identification Number (TIN), full name, or address in addition to the vendor name. The review by NASA resulted in the single matched payment of $996 being deemed as proper and reported back to Treasury as such.

Implementation of the Do Not Pay Initiative to Prevent Improper Payments (A-136 Table 7)

Month	Number (#) of payments reviewed for possible improper payments *Note 1*	Dollars ($) of payments reviewed for possible improper payments *Note 1*	Number (#) of payments stopped	Dollars ($) of payments stopped	Number (#) of improper payments reviewed and determined accurate	Dollars ($) of improper payments reviewed and determined accurate
Oct 15	10,627	$1,041,698,651	0	0	1	$996
Nov 15	10,861	$1,243,135,877	0	0	0	0
Dec 15	11,324	$1,931,311,323	0	0	0	0
Jan 16	7,960	$867,408,673	0	0	0	0
Feb 16	9,354	$1,176,368,179	0	0	0	0
Mar 16	11,141	$1,160,880,055	0	0	0	0
Apr 16	10,059	$998,628,551	0	0	0	0
May 16	11,300	$1,011,508,438	0	0	0	0
Jun 16	12,117	$1,206,657,697	0	0	0	0
Jul 16	10,477	$1,088,452,925	0	0	0	0
Aug 16	12,245	$1,173,811,017	0	0	0	0
Sep 16	8,802	$963,739,270	0	0	0	0
Totals	**126,267**	**$13,863,600,656**	**0**	**0**	**1**	**$996**

	Number (#) of payments reviewed for possible improper payments *Note 1*	Dollars ($) of payments reviewed for possible improper payments *Note 1*	Number (#) of payments stopped	Dollars ($) of payments stopped	Number (#) of potential improper payments reviewed and determined accurate *Note 1*	Dollars ($) of potential improper payments reviewed and determined accurate *Note 1*
Reviews with the IPERIA specified databases	126,267	$13,863,600,656	0	$0	1	$996
Reviews with databases not listed in IPERIA	N/A	N/A	N/A	N/A	N/A	N/A

Note 1: Payment Activity Report data is from **October 2015 - August 31, 2016**, Adjudication Summary Reports for **September 2016 (as of 9/21/16, data subject to change)**. During this time period, there were a total of 126,267 payments made by Treasury on behalf of NASA with a dollar value of $13.864B. Treasury uses only the vendor name in SAM to identify any matches for potential improper payments. NASA researches any identified matches, validating the data using the Tax Identification Number (TIN), full name or address in addition to the vendor name. The review by NASA resulted in the single matched payment of $996 being deemed as proper and reported back to Treasury as such.

Combined Schedule of Spending

The Combined 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 SOS 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
Total Resources	→	Total Budgetary Resources
Total Amounts Agreed to be Spent	→	New Obligations and Upward Adjustments
Total Spending	→	Gross Outlays

USASpending.gov is a Federal Web site 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 Governmentwide. The Agency's financial system is used to generate the SBR.

Combined Schedule of Spending (continued)

(In Millions of Dollars)	2016	2015
Section I: What Money is Available to Spend?		
Total Resources	$ 23,619	$ 22,175
Less Amount Available but Not Agreed to be Spent	994	1,016
Less Amount Not Available to be Spent	98	88
Total Amounts Agreed to be Spent	**$ 22,527**	**$ 21,071**
Section II: How was the Money Spent?		
Space Operations		
Personnel compensation and benefits	$ 358	$ 321
Contractual services and supplies	4,486	3,231
Acquisition of assets	26	21
Grants and fixed charges	24	25
Other	1	—
Total Spending	**4,895**	**3,598**
Science		
Personnel compensation and benefits	$ 312	$ 305
Contractual services and supplies	3,976	3,996
Acquisition of assets	33	27
Grants and fixed charges	587	570
Other	—	—
Total Spending	**4,908**	**4,898**
Exploration		
Personnel compensation and benefits	$ 429	$ 464
Contractual services and supplies	3,666	4,241
Acquisition of assets	72	60
Grants and fixed charges	65	67
Other	—	—
Total Spending	**4,232**	**4,832**
Aeronautics		
Personnel compensation and benefits	$ 202	$ 193
Contractual services and supplies	309	289
Acquisition of assets	28	22
Grants and fixed charges	28	32
Other	—	—
Total Spending	**567**	**536**

(In Millions of Dollars)	2016	2015
Section II: How was the Money Spent? (continued)		
Safety Security and Mission Services		
Personnel compensation and benefits	$ 1,249	$ 1,239
Contractual services and supplies	3,280	3,417
Acquisition of assets	68	80
Grants and fixed charges	28	31
Other	28	26
Total Spending	**4,653**	**4,793**
Education		
Personnel compensation and benefits	$ 8	$ 8
Contractual services and supplies	23	22
Acquisition of assets	—	—
Grants and fixed charges	84	81
Other	—	—
Total Spending	**115**	**111**
Office of Inspector General		
Personnel compensation and benefits	$ 32	$ 31
Contractual services and supplies	6	6
Acquisition of assets	—	—
Grants and fixed charges	—	—
Other		1
Total Spending	**38**	**38**
Space Technology		
Personnel compensation and benefits	$ 111	$ 114
Contractual services and supplies	366	367
Acquisition of assets	4	4
Grants and fixed charges	32	33
Other	—	—
Total Spending	**513**	**518**
Construction and Environmental Compliance Restoration		
Personnel compensation and benefits	$ —	$ —
Contractual services and supplies	194	208
Acquisition of assets	298	327
Grants and fixed charges	—	—
Other	—	7
Total Spending	**492**	**542**
Other		
Personnel compensation and benefits	$ 19	$ 19
Contractual services and supplies	1,064	1,072
Acquisition of assets	10	11
Grants and fixed charges	1	2
Other	1	—
Total Spending	**1,095**	**1,104**
Total Spending	**$ 21,508**	**$ 20,970**
Section III: Who did the Money go to?		
Federal	$ 1,459	$ 1,353
Non-Federal	21,068	19,718
Total Amounts Agreed to be Spent	**$ 22,527**	**$ 21,071**

NASA FY 2016 Public Law 114-113 Undisbursed Balances in Expired Grants Accounts

NASA monitors and tracks grants undisbursed balances in expired accounts through a monthly review of internal control activities designed to identify undisbursed balances in expired accounts. The Continuous Monitoring Program (CMP) ensures ongoing review and validation of financial data and the effectiveness of internal controls over the entire financial management process, including grants. When grants undisbursed balances in expired accounts are identified, appropriate action is taken to ensure optimum use of grant resources.

NASA generates financial management reports to aid in the tracking and monitoring of undisbursed amounts. An aging report of open obligations is generated on a monthly basis to determine the last day activity occurred. For open obligations in which no activity has occurred in a six-month period and/or there is no supporting documentation, further review is performed to determine the validity of obligation balances and the existence of valid source documentation. Additionally, further analysis is performed to determine if funds can be de-obligated. If obligations are valid, the aging reports are updated to reflect that obligations have been confirmed with procurement as valid.

NASA will continue to track undisbursed balances in expired grant accounts through its monthly review of internal control activities designed to identify funds for de-obligation. This involves the continuous monitoring of undisbursed balances, identifying balances that should be de-obligated, and performing timely close-out of grants and other activities. Additionally, NASA's financial management and procurement offices will continue to collaborate in monitoring and tracking undisbursed balances.

Currently, NASA does not have undisbursed balances in expired grants that may be returned to the Treasury of the United States. The following chart reflects the total number and dollar amount of undisbursed grants. All amounts have been obligated to a specific project.

Fiscal Year	Total Number of Expired Grants with Undisbursed Balances	Total Amount of Undisbursed Balances for Expired Grants *(In Millions of Dollars)*
2013	948	$5.7
2014	937	$4.5
2015	953	$4.9

Freeze the Footprint

The National Aeronautics and Space Administration (NASA) is committed to the goal of reducing office and warehouse building inventory compared to its FY 2012 baseline to lower costs associated with real property in accordance with Section 3 of the Office of Management and Budget (OMB) Memorandum 12-12, *Promoting Efficient Spending to Support Agency Operations,* and OMB Management Procedures Memorandum 2013-02, *Freeze the Footprint* policy implementation guidance. NASA continues to meet its national responsibilities, fully leveraging retained assets to increase their functionality in support of mission success while disposing of unneeded Federal real estate, increasing the use of underutilized assets, minimizing operating costs, and improving efficiency.

NASA has implemented several initiatives that advance the goals of the Freeze the Footprint policy including establishing an Agency facilities strategy, enhanced facilities master planning, incorporating renewal and consolidation projects into the capital investment program, and incentivizing asset divestment via a demolition program funded at the Agency level. NASA evaluates its real property, through the Master Planning process, periodic data analysis, and special studies to identify facilities that are no longer needed. Center master plans identify requirements for new construction as well as buildings that can be demolished. Consolidations, renovations, and new construction aim to utilize space and energy more efficiently in all classes of NASA buildings.

NASA has an active demolition program. Since 2004, NASA has disposed of more than 1.8 million square feet of office and warehouse space. This demolition program has been an important tool in eliminating non-essential facilities. NASA has reduced maintenance and utility costs by consolidating functions previously performed in these disposed facilities into new, smaller facilities. Studies conducted by NASA on its new consolidated facilities validate measurable savings in utility costs.

While NASA divested nearly 400 thousand square feet of office and warehouse space since the FY 2014 report, the figures below also include data corrections that more fully reflect its portfolio. The increase in square feet is partially driven by NASA's recent effort to ensure all of its buildings, particularly those under $5,000 in acquisition cost, are documented in its asset management system. Reflecting these long-held assets masks NASA's continuing progress at consolidating its building footprint.

NASA will continue identifying, implementing and executing facility efficiency and effectiveness through management, development and operational strategies that reduce life cycle cost and risk while ensuring safety and mission success.

Freeze the Footprint Baseline Comparison	FY 2012 Baseline	FY 2015	Change (FY 2012 Baseline - FY 2015)
Square Footage *(SF Millions)*	15.715	15.519	(0.196)
Operation and Maintenance Cost *($ in Millions)*	$95	$85	($10)

Civil Monetary Penalty Adjustment for Inflation

For the Fiscal Year Ended September 30, 2016

The Federal Civil Penalties Inflation Adjustment Act of 1990, as amended, requires agencies to make regular and consistent inflationary adjustments of civil monetary penalties to maintain their deterrent effect. To improve compliance with the Act, and in response to multiple audits and recommendations, agencies should report annually in the Other Information section the most recent inflationary adjustments to civil monetary penalties to ensure penalty adjustments are both timely and accurate.

Authority (Statute)	Penalty (Name of Penalty)	Year Enacted	Latest Year of Adjustment	Current Penalty Level ($ Amount)	Sub-Agency/ Bureau Unit	Location for Penalty Update Details
Department of the Interior and Related Agencies Appropriations Act of 1989, P.L. 101-121, sec. 319. (aka, Byrd Anti-Lobbying Amendment)	Penalty for use of appropriated funds to lobby or influence certain contracts	1989	1989	$100,000	N/A	http://nodis3.gsfc.nasa.gov/
Program Fraud Civil Remedies Act of 1986	Penalty for False Claims	1986	1986	$5,000	N/A	http://nodis3.gsfc.nasa.gov/
Department of the Interior and Related Agencies Appropriations Act of 1989, P.L. 101-121, sec. 319.	Penalty for failure to report certain lobbying transactions	1989	1989	$100,000	N/A	http://nodis3.gsfc.nasa.gov/

Summary of Financial Statement Audit and Management Assurances

The following tables summarize the Agency's FY 2016 Financial Statement Audit and Management Assurances. Table 1 summarizes the status of prior year—FY 2015 material weaknesses identified, if any, by the Financial Statement Auditors. 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	Unmodified					
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	Unmodified					
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 lack of substantial compliance noted	No lack of substantial compliance noted
2. Accounting Standards	No lack of substantial compliance noted	No lack of substantial compliance noted
3. USSGL at Transaction Level	No lack of substantial compliance noted	No lack of substantial compliance noted

Appendix

Glossary of Acronyms + Hyperlinks

Astronaut Suni Williams jumps into the Hydro Impact Basin at NASA's Langley Research Center after completing a practice session with an Air Force pararescue team with a mock-up of a Boeing CST-100 Starliner. **Photo credit:** NASA/ Langley Research Center

Glossary of Acronyms

AAIRS	Audit and Assurance Information Reporting System
AES	Advanced Exploration Systems
AFO	Audit Follow-Up Official
AFR	Agency Financial Report
AFRC	Armstrong Flight Research Center
AIA	Aerospace Industry Association
AICPA	American Institute of Certified Public Accountants
ALR	Audit Liaison Representatives
AMO	Agency Management and Operations
APG	Agency Priority Goal
API	Annual Performance Indicator
APR	Annual Performance Report
ARC	Ames Research Center
ARMD	Aeronautics Research Mission Directorate
ARRM	Asteroid Redirect Robotic Mission
ASC	Accounting Standards Codification
ATV	Automated Transfer Vehicle
BPDD	Business Process Design and Documentation
CALTECH	California Institute of Technology
CAP	Cross Agency Priority
CCP	Commercial Crew Program
CCR	Contractor Cost Reporting
CF	Core Financial
CFO	Chief Financial Officer
CIO	Chief Information Officer
CM	Crew Module
CMO	Center Management and Operations
CMP	Continuous Monitoring Program
CoF	Construction of Facilities
COTS	Commercial Off-The-Shelf
CSRS	Civil Service Retirement System
DATA	Digital Accountability and Transparency Act
DCIA	Debt Collection Improvement Act
DM	Deferred Maintenance
DM&R	Deferred Maintenance and Repairs
DSCOVR	Deep Space Climate Observatory

EGS	Exploration Ground Systems
EM	Exploration Mission
EPSCoR	Experimental Program to Stimulate Competitive Research
ERM	Enterprise Risk Management
ERP	Enterprise Resource Planning
FAR	Federal Acquisition Regulation
FASAB	Federal Accounting Standards Advisory Board
FASB	Financial Accounting Standards Board
FBWT	Fund Balance with Treasury
FCI	Facility Condition Index
FECA	Federal Employees' Compensation Act
FEGLI	Federal Employees Group Life Insurance
FEHB	Federal Employees Health Benefits
FERS	Federal Employment Retirement System
FFMIA	Federal Financial Management Improvement Act
FFRDC	Federally Funded Research and Development Center
FISCAM	Federal Information System Controls Audit Manual
FMFIA	Federal Managers' Financial Integrity Act
FOIA	Freedom of Information Act
FPTBU	Funds to be Put to Better Use
FY	Fiscal Year
GAAP	Generally Accepted Accounting Principles
GAO	Government Accountability Office
GCTC	Gagarin Cosmonaut Training Center
GOES-R	Geostationary Operational Environmental Satellite
GOLD	Global-scale Observations of the Limb and Disk
G-PP&E	General Property, Plant and Equipment
GPRAMA	Government Performance and Results Act Modernization Act of 2010
GRACE-FO	Gravity Recovery and Climate Experiment Follow-on
GRC	Glenn Research Center
GSFC	Goddard Space Flight Center
HEOMD	Human Exploration and Operating Mission Directorate
HQS	NASA Headquarters
HTV	H-II Transfer Vehicle
HVAC	Heating, Ventilating and Air-Conditioning
I3P	IT Infrastructure Integration Program
IBNR	Incurred But Not Reported
ICE Sat2	Ice, Cloud and Land Elevation Satellite-2

ICON	Ionospheric Connection Explorer
IPERA	Improper Payments Elimination and Recovery Act
IPERIA	Improper Payments Elimination and Recovery Improvement Act
IPIA	Improper Payments Information Act
ISRU	In-Situ Resource Utilization
ISS	International Space Station
IT	Information Technology
JPL	Jet Propulsion Laboratory
JPSS	Joint Polar Satellite System
JSC	Johnson Space Center
KMSAL	Key Management Single Audit Liaison
KSC	Kennedy Space Center
LBFD	Low Boom Fight Demonstrator
LEO	Low Earth Orbit
LSP	Launch Services Program
M&R	Maintenance and Repairs
MdM	Metadata Manager
MOMA	Mars Organic Molecule Analyzer
MOXIE	The Mars Oxygen ISRU Experiment
MSD	Mission Support Directorate
MSFC	Marshall Space Flight Center
MSWG	Management Systems Working Group
NASA	National Aeronautics and Space Administration
NICER	Neutron star Interior Composition Explorer
NISAR	NASA-ISRO Synthetic Aperture Radar
NOAA	National Oceanic and Atmospheric Administration
NSSC	NASA Shared Services Center
OCE	Office of the Chief Engineer
OCFO	Office of Chief Financial Officer
OCHMO	Office of the Chief Health and Medical Officer
OHCM	Office of Human Capital Management
OIG	Office of Inspector General
OMB	Office of Management and Budget
OSIRIS-REx	Origins Spectral Interpretation Resource Identified Security - Regolith Explorer Mission
OSMA	Office of Safety and Mission Assurance
PG	Performance Goal
P.L.	Public Law
PMMe	Performance Measures Manager Extension

PPS	Procurement for Public Sector
QM-2	Qualification Motor
R&D	Research and Development
R&T	Research and Technology
RBI	Radiation Budget Instrument
RPT	Rocket Propulsion Testing
SAAO	Single Audit Accountable Official
SAM-EPLS	System for Award Management Excluded Parties List System
SAP	Systems Applications & Products
SAT	Senior Assessment Team
SBIR	Small Business Innovation Research
SBR	Statement of Budgetary Resources
SCaN	Space Communications and Navigation
SCAP	Strategic Capabilities Assets Program
SEP	Solar Electric Propulsion
SEWP	Solutions for Enterprise-Wide Procurement
SFFAS	Statement of Federal Financial Accounting Standards
SLS	Space Launch System
SMD	Science Mission Directorate
SNC	Statement of Net Cost
SOAR	Strategic Objective Annual Review
SOC	Solar Orbiter Collaboration
SOS	Schedule of Spending
SPP	Solar Probe Plus
SSA-DMF	Social Security Administration Death Master File
SSC	Stennis Space Center
STEM	Science, Technology, Engineering and Mathematics
STMD	Space Technology Mission Directorate
SWOT	Surface Water Ocean Topography
STTR	Small Business Technology Transfer
TESS	Transiting Exoplanet Survey Satellite
TIN	Tax Identification Number
US	United States
WCF	Working Capital Fund
Webb	James Webb Space Telescope
WFIRST	Wide Field InfraRed Survey Telescope

Listing of URL Hyperlinks

http://nodis3.gsfc.nasa.gov/

http://performance.gov

http://science.nasa.gov/

http://www.nasa.gov/

http://www.nasa.gov/about/org_index.html

http://www.nasa.gov/directorates/heo/index.html

http://www.nasa.gov/directorates/spacetech/home/index.html

http://www.nasa.gov/msd

http://www.nasa.gov/news/budget/index.html

http://www.nasa.gov/offices/education/about/index.html

http://www.nasa.gov/sites/default/files/atoms/files/fy14_apr-fy16_app.pdf

http://www.nasa.gov/sites/default/files/atoms/files/nasa_fy2015_apr-fy2017_app.pdf

http://www.nasa.gov/topics/aeronautics/index.html

https://wicn.nssc.nasa.gov/

https://www.gpo.gov/fdsys/pkg/PLAW-112publ248/pdf/PLAW-112publ248.pdf

https://www.nasa.gov/sites/default/files/files/FY2014_NASA_SP_508c.pdf

https://www.performance.gov/agency/national-aeronautics-and-space-administration?view=public

https://www.usaspending.gov/Pages/Default.aspx

https://www.whitehouse.gov/sites/default/files/omb/assets/financial_improper/11202009_improper_payments.pdf

https://www.whitehouse.gov/sites/default/files/omb/financial/_improper/PL_107-107.pdf

https://www.whitehouse.gov/sites/default/files/omb/financial/_improper/PL_107-300.pdf

https://www.whitehouse.gov/sites/default/files/omb/financial/_improper/PL_111-204.pdf

https://www.whitehouse.gov/sites/default/files/omb/memoranda/2013/m-13-07.pdf

https://www.whitehouse.gov/sites/default/files/omb/memoranda/2013/m-13-20.pdf

https://www.whitehouse.gov/sites/default/files/omb/memoranda/2015/m-15-02.pdf

Strategic Goal 1 Highlight URLs

Orion Pressure Vessel Passes Test

http://www.nasa.gov/feature/orion-passes-the-pressure-test

Astronauts Enter ISS Inflatable Module for First Time

http://www.nasa.gov/feature/astronaut-s-first-steps-into-beam-will-expand-the-frontiers-of-habitats-for-space

Trailblazing Science and Cargo to ISS Aboard SpaceX Resupply Mission

http://www.nasa.gov/press-release/nasa-sends-trailblazing-science-cargo-to-international-space-station-aboard-spacex

Magnetospheric Multiscale Observes Magnetic Reconnection

https://www.nasa.gov/feature/goddard/2016/nasa-directly-observes-fundamental-process-of-nature-for-1st-time

Mars 2020 Rover Passes Major Development Milestone

http://www.nasa.gov/press-release/nasas-next-mars-rover-progresses-toward-2020-launch

Four Months after Pluto Flyby, New Horizons Yields Wealth of Discovery

http://www.nasa.gov/press-release/four-months-after-pluto-flyby-nasa-s-new-horizons-yields-wealth-of-discovery

James Webb Space Telescope Primary Mirror Fully Assembled

http://www.nasa.gov/press-release/nasas-james-webb-space-telescope-primary-mirror-fully-assembled

Wide Field Infrared Survey Telescope Formally Begins

http://www.nasa.gov/press-release/nasa-introduces-new-wider-set-of-eyes-on-the-universe

Hubble Makes First Atmospheric Study of Earth-Sized Exoplanets

http://www.nasa.gov/press-release/nasa-s-hubble-telescope-makes-first-atmospheric-study-of-earth-sized-exoplanets

Selection Made for Solar Electric Propulsion Development

http://www.nasa.gov/press-release/nasa-works-to-improve-solar-electric-propulsion-for-deep-space-exploration

Strategic Goal 2 Highlight URLs

NASA Begins Work to Build a Quieter Supersonic Passenger Jet

http://www.nasa.gov/press-release/nasa-begins-work-to-build-a-quieter-supersonic-passenger-jet

New Airspace Technology Demonstration Lab Opens

http://www.nasa.gov/press-release/transportation-department-nasa-partners-visit-charlotte-to-open-test-lab-to-streamline

Study to Follow the Trail of Greenhouse Gases Through American Skies

http://www.nasa.gov/feature/langley/nasa-study-to-follow-the-trail-of-greenhouse-gases-through-american-skies

NASA Satellite Maps Show Human Fingerprint on Global Air Quality

http://www.nasa.gov/press-release/new-nasa-satellite-maps-show-human-fingerprint-on-global-air-quality

CORAL Campaign Will Raise Reef Studies to a New Level

http://www.nasa.gov/press-release/nasas-coral-campaign-will-raise-reef-studies-to-a-new-level

NASA Innovative Advanced Concepts Invests in 2D Spacecraft and Reprogrammable Microorganisms

http://www.nasa.gov/press-release/nasa-invests-in-two-dimensional-spacecraft-reprogrammable-microorganisms

Dozens of Patents Available in Public Domain to Benefit U.S. Industry

http://www.nasa.gov/press-release/nasa-makes-dozens-of-patents-available-in-public-domain-to-benefit-us-industry

Experimental Program to Stimulate Competitive Research (EPSCoR) Grant Awards Made

http://www.nasa.gov/press-release/nasa-awards-grants-for-university-research-and-development-programs

Strategic Goal 3 Highlight URLs

Computational Facility Named After Langley "Human Computer" Katherine Johnson

https://www.nasa.gov/feature/langley/computational-facility-named-in-tribute-to-nasa-langley-math-master-katherine-johnson

Crews 'Top Out' First of Two New SLS Test Stands at MSFC

http://www.nasa.gov/exploration/systems/sls/two-new-sls-test-stands-at-marshall

RS-25 Engine Tests for SLS March On

http://www.nasa.gov/image-feature/nasa-marches-on-with-test-of-rs-25-engine-for-new-space-launch-system

NASA's OSIRIS-REx Speeds Toward Asteroid Rendezvous

https://www.nasa.gov/press-release/nasa-s-osiris-rex-speeds-toward-asteroid-rendezvous

SCaNiversary - Ten Years of Space Communications and Navigation Program Office

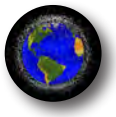
http://www.nasa.gov/directorates/heo/scan/news_scan_tenth_anniversary.html

Meet NASA Datanauts: 2016 Class

https://open.nasa.gov/blog/meet-nasa-datanauts-2016-class/

Updates to Policy on Mishap and Close Call Reporting, Investigating and Recordkeeping Improve Investigation Process

https://sma.nasa.gov/news/articles/newsitem/2016/05/25/updates-to-policy-on-mishap-and-close-call-reporting-investigating-and-recordkeeping-improve-investigation-process



2016's First Issue of Orbital Debris Quarterly News Now Available

https://sma.nasa.gov/news/articles/newsitem/2016/05/05/2016s-first-issue-of-orbital-debris-quarterly-news-now-available

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We offer special thanks to our layout designer, Rahn Johnson.

The first six of 18 segments that will form NASA's James Webb Space Telescope's primary mirror for space observations begin the final round-the-clock cryogenic testing. These tests will confirm the mirrors will respond as expected to the extreme temperatures of space prior to integration into the telescope's permanent housing structure. **Photo credit:** NASA/MSFC/David Higginbotham

The SpaceX Dragon spacecraft arrives at the International Space Station with nearly 5,000 pounds of cargo. Instruments to perform the first-ever DNA sequencing in space, and the first international docking adapter for commercial crew spacecraft, are among the cargo of the SpaceX Commercial Resupply Services-9 (CRS-9) mission. **Photo credit:** NASA

A crane lifts the qualification test article of the launch vehicle stage adapter (LVSA) after final manufacturing on a 30-foot welding tool at the Marshall Space Flight Center. The test version of the LVSA and other structural test articles for the upper part of the rocket will be tested later this year at Marshall to verify the integrity of the hardware and ensure it can withstand the forces it will experience during flight. **Photo credit:** NASA/MSFC/Emmett Given

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