HOLD FOR RELEASE
UNTIL PRESENTED
BY WITNESS
March 20, 2013

Statement of
The Honorable Charles F. Bolden, Jr.
Administrator
National Aeronautics and Space Administration

before the

Subcommittee on Commerce, Justice, Science, and Related Agencies
Committee on Appropriations
U.S. House of Representatives

Mr. Chairman and Members of the Subcommittee, I am pleased to have this opportunity to update the Subcommittee on NASA's continuing progress in implementing the bi-partisan program for NASA agreed to by the President and Congress, which will ensure the United States continues to lead the world in space exploration, technology, innovation, and scientific discovery. We are developing spaceflight capabilities to send humans to an asteroid by 2025 and on to Mars in the 2030's. We are building the world's most powerful rocket, the Space Launch System (SLS), and a deep space exploration crew vehicle, the Orion Multi-Purpose Crew Vehicle (MPCV). American astronauts are living and working in space on board the International Space Station (ISS), conducting an expanding research program with an array of partners. With the help of American companies, we are resupplying the space station and launching these missions from U.S. soil, and we are on track to send our astronauts to space from American shores in just the next few years. In critical support of the Agency's broader mission, we are developing and testing future technologies that will enable us to move and operate faster and more efficiently in space, land more mass accurately on another planet, and enable new destinations. Our aeronautics research is making air travel cleaner, safer and more efficient. With 60 missions actively observing the Earth, the planets, the Sun and the Universe, we remain the world's premier space science organization and the critical source of information for an understanding of Earth's climate that can only be gained from the global perspective of space. We are extending these cutting-edge capabilities with major new developments, including the James Webb Space Telescope and a new Mars rover for 2020. Despite an uncertain budget climate, NASA is delivering the world's preeminent space program, supporting an innovation economy and broadening our experience of the universe around us.

As is briefly described below, NASA's resources are directed to accomplish the goals set for the Agency by the Congress and the President. We continue to pursue these long-range plans within a budgetary environment that can be difficult to predict. Our improved processes for cost estimating and program management play a critical role in our ability to manage within this difficult resource environment, and we remain on track in our major developments. NASA is confident that we can continue to execute the program described below within the budget levels anticipated in the President's FY 2013 request for NASA. We will attempt to maintain and implement long-term development plans within future budgets as they are appropriated. Budget stability has been identified by multiple expert panels as a primary requirement for efficient project execution in development programs, such as those that form the core of our efforts. The Agency stands committed to executing our program as efficiently as possible within the budgetary constraints we face.

Earth Science

Seventeen Earth Science missions currently in orbit study the home planet as an integrated system, including the recently launched Landsat Data Continuity Mission (LDCM), which is currently undergoing on-orbit checkout. NASA missions continue to give us a global perspective on how the climate works as a system and how it is changing over time. Few products of NASA's research can be as valuable, in a material sense, as an accurate understanding of the future of the climate. NASA is working to complete and launch three new Earth science missions in FY 2014, with a fourth scheduled for launch in Fall 2014. The Global Precipitation Measurement (GPM) mission, a cooperative mission with the Japan Aerospace Exploration Agency (JAXA), will to help provide global precipitation observations and the Orbiting Carbon Observatory-2 (OCO-2) will provide accurate global measurements of atmospheric carbon dioxide levels. NASA will install the Stratospheric Aerosol and Gas Experiment III (SAGE III) on the ISS to continue critical long-term measurements of the vertical structure of aerosols, ozone, water vapor and other important trace gases in the upper atmosphere. In the fall of 2014, NASA will launch the Soil Moisture Active Passive (SMAP) mission to study the Earth's hydrologic cycle.

Astrophysics and James Webb Space Telescope

NASA is on track and making excellent progress on the James Webb Space Telescope, the most powerful telescope in history. The Webb telescope is the next in a series of astrophysics missions, including the venerable, yet still unrivaled Hubble Space Telescope and the incredibly productive Kepler exoplanet mission, which are revolutionizing our understanding of the universe. After launching in 2018, the Webb telescope will travel one million miles from Earth, unfold its sunshield to the size of a tennis court, and keep its instruments cooled to a temperature of 370-387 degrees below zero Fahrenheit (40-50 degrees Kelvin). The Webb telescope will allow us to observe objects even fainter than the Hubble Space Telescope can see, which will allow us to study every phase in the history of our universe, ranging from the first luminous glows after the Big Bang, to the formation of solar systems capable of supporting life on planets like Earth, to the evolution of our own solar system. In the coming year, NASA plans to finish the Webb science instruments, begin their testing as an integrated science payload, and commence construction on the spacecraft that will carry the science instruments and the telescope. NASA's Stratospheric Observatory for Infrared Astronomy (SOFIA) airborne observatory is making its second year of science observations. Operating at altitudes of between 39,000 to 45,000 feet (12-14 kilometers) and above 99 percent of the water vapor in the atmosphere, SOFIA makes observations that are unobtainable from telescopes on the ground. In the coming year, SOFIA will begin its next set of science observations; flying out of Palmdale, California, and Christchurch, New Zealand, SOFIA will observe star-forming regions in our galaxy from its vantage point at the top of the Earth's atmosphere.

Planetary Science

Building on the brilliant success of NASA's new Curiosity rover on Mars, NASA has announced plans for a robust multi-year Mars program, including a new robotic science rover based on the Curiosity design set to launch in 2020. The current portfolio includes the Curiosity and Opportunity rovers; the 2013 Mars Atmosphere and Volatile EvolutioN (MAVEN) orbiter to study the Martian upper atmosphere; the 2016 Interior Exploration using Seismic Investigations, Geodesy and Heat Transport (InSight) mission (which will take the first look into the deep interior of Mars); participation in the European Space Agency's 2016 and 2018 ExoMars missions; and the new Mars rover planned for launch in 2020.

Last summer, NASA's Dawn mission completed more than a year in orbit around the asteroid Vesta, and departed for its 2015 rendezvous with Ceres, the largest known asteroid. NASA is developing a robotic asteroid rendezvous and sample return mission, dubbed OSIRIS-REx (for Origins-Spectral Interpretation-Resource Identification-Security-Regolith Explorer), which is planned to launch in 2016. After traveling three years, OSIRIS-REx will approach the Near Earth Asteroid1999 RQ36, map the asteroid, and collect

a sample of up to 2.2 pounds for return to Earth; this mission will provide valuable data and experience in support of NASA's planned human exploration of a Near Earth Asteroid.

Heliophysics

Perhaps even more dynamic than the Earth's climate are the processes taking place within the Earth's nearby star, the Sun. NASA's Heliophysics Program operates nearly 20 spacecraft to expand our understanding of the Sun, its complex interaction with Earth, other planetary systems, the vast space within the solar system, and the interface with interstellar space. Last year saw the successful launch of the Van Allen Probes, which, in a few short months, have already redefined our understanding of the Earth's radiation belts. The coming year will include final development and launch of the Interface Region Imaging Spectrograph (IRIS), as well as continued development of the Magnetospheric Multiscale (MMS) mission, which is planned for launch in 2015 to investigate how the Sun's and Earth's magnetic fields connect and disconnect. NASA continues to formulate the Solar Probe Plus (SPP) mission and develop its contribution to the European Space Agency's Solar Orbiter mission.

Aeronautics Research

NASA's innovative aeronautics research supports the Nation's aviation industry's efforts to maintain competitiveness in the global market. Our research provides the flying public with an improved flying experience and fewer delays, while also maintaining an outstanding safety level. NASA's breakthrough research into more efficient air traffic management and environmentally friendly aircraft helps U.S. air carriers to operate their fleets more efficiently while reducing operating costs. Today, we are pursuing an ambitious research agenda for substantially reducing fuel consumption, emissions and noise to make the Next Generation Air Transportation System (NextGen) a reality. Looking ahead, NASA is paving the way for further industry innovation through demonstration in flight of new aircraft wing technology designed to save fuel by reducing weight and drag, and continued flight research of low-boom technology designed to reduce sonic booms enough to eliminate the barrier to overland civil supersonic flight. By advancing the state of the art in vehicle and air traffic management technology, NASA is directly contributing to the Nation's bottom line. In recent years, civil aviation has accounted for $1.3 trillion in U.S. economic activity annually, and employed over ten million people. It has provided the Nation with a $47 billion positive balance of trade.

Space Technology

Space Technology enables our future in space by drawing on talent from the NASA workforce, academia, small businesses, and the broader space enterprise to deliver innovative solutions that dramatically lower costs and improve technological capabilities for NASA and the Nation. In 2012, we successfully fabricated a 2.4-meter composite cryogenic propellant tank. We will scale this design up and test a 5.5-meter diameter tank to enable lower mass rocket propellant tanks that will meet future SLS needs. The Small Businesses Innovation Research and Small Business Technology Transfer (SBIR and STTR) programs saw six previously funded technologies make their way to Mars last August with the landing of Curiosity. In 2014, we will fly a cluster of eight CubeSats that will make coordinated space science observations. We will also conduct high altitude tests of new full-scale parachute and drag devices designed to enable precise landing of higher-mass payloads to the surface of planets. In addition, NASA will launch the Sunjammer Solar Sail, which will demonstrate solar sail propulsion as an advanced space weather warning system. Over the past two years, Space Technology engaged over 100 U.S. universities and academic institutions with approximately 350 activities, including fellowships, direct competitive awards and through partnerships with NASA Centers, small businesses and commercial contractors. We will continue releasing a steady stream of new solicitations, tapping into the Nation's talent to ensure the availability of advanced technologies. Following the National Research Council's review of the Space Technology Roadmaps, the Agency released and is implementing the key tenets of the Strategic Space Technology Investment Plan. NASA's community of innovators are applying, testing, and reworking cutting-edge research into potentially "game-changing" solutions that can accelerate a timeline, slash

projected costs, or multiply science return. NASA makes progress in essential space technologies daily, enabling more capable and far reaching future space activities for our Nation.

Exploration Systems

NASA continues to meet its milestones in the development of the SLS, a rocket system ultimately capable of bringing an unprecedented 130 metric tons of payload to Earth orbit. The Orion Multi-Purpose Crew Vehicle (MPCV) program continues on schedule for an uncrewed test flight in 2014. This test flight, Exploration Flight Test-1, will see Orion conduct two orbits of the Earth and reenter the atmosphere at a high speed characteristic of a returning deep space exploration mission. The test will provide valuable data about the spacecraft's systems, most importantly, its heat shield. The flight test article for this mission is already in place at the Kennedy Space Center and being readied for this test. The first uncrewed test of the Orion and the SLS together, known as Exploration Mission-1, is planned for 2017, with the first crewed mission of the two vehicles slated for 2021. These two missions will test and demonstrate these systems in Earth-Moon space, providing a foundation for future human deep space exploration missions. Together, the SLS and Orion MPCV represent a critical step on the path to human deep space exploration.

International Space Station

Deep space exploration will be made possible by building on the knowledge and experience the Agency is gaining by having American astronauts living , working, and conducting research on the ISS. Every 90 minutes, an international crew of 6 orbits the Earth aboard the football field–size space station. Our plans for the coming year include preparing for an extended duration, year-long human-crewed mission to explore human adaptation to space, and the addition of three Earth Science instruments that will exploit ISS' capabilities to study winds over the oceans and the movement of dust, smoke, and pollution through the atmosphere. The Center for the Advancement of Science in Space is now managing the National Laboratory research being done on ISS by an array of organizations, including commercial researchers interested in taking advantage of this unique, microgravity facility.

Commercial Crew and Cargo

A top priority for NASA and the Nation is to affordably and safely launch American astronauts and their supplies from U.S. soil, ending our reliance on foreign providers and bringing that work back home. Under NASA's Commercial Resupply Services (CRS) contracts, Space Exploration Technologies (SpaceX) was awarded 12 cargo flights to the space station, and Orbital Sciences Corporation (Orbital) was awarded 8. SpaceX executed its first cargo mission to the ISS in October 2012, successfully delivering its cargo and returning scientific samples to Earth. SpaceX is currently flying its second CRS mission, and its Dragon spacecraft is slated to return to Earth on March 25. Orbital is preparing for the maiden flight of its Antares rocket in April; they will then conduct a demonstration flight of the Antares with the Cygnus spacecraft this spring, followed by Orbital's first contracted mission under CRS later this year. NASA continues to work with its commercial partners to develop a commercial capability for human spaceflight. NASA intends to procure commercial crew services to ISS by 2017. Through the successful execution of this partnership, we will return to the United States the vital capability to launch astronauts to the ISS and return them to Earth. Because our commercial space partners continue to make rapid progress toward meeting the Agency's requirements for access to the ISS and to low Earth orbit, NASA is able to focus its human exploration resources to develop the deep space capabilities represented by the SLS and Orion MPCV.

Conclusion

NASA thrives on the synergy created by a critical mass of brilliant scientific and engineering talent. We work, as an Agency, to send humans to an asteroid and on to orbit Mars. We work, as an Agency, to understand the universe from the beginning of time to the future of Earth's climate. The people working

to put the next rover on Mars are refining the systems necessary to put humans there in the future. The people testing advanced ring-sail parachutes for landing payloads on planetary surfaces are also learning how flight through an atmosphere at super-high speeds works. The astronauts running physical science experiments on the ISS are themselves life science experiment subjects, and at the same time, they are demonstrating the science and technology for living and working in space. The Agency is on track and making steady progress executing the space program defined for us by Congress and the President in the 2010 Authorization Act, and we are confident we can accomplish the programs we have undertaken under that direction. NASA's confidence that we can execute the program described here is based primarily on the demonstrated expertise, flexibility, and dedication of our people. The reason why NASA ranks as the best place to work in the Federal government may simply be this: We all are contributors to a mission greater than ourselves, extending beyond the current generation. We tackle national and global challenges. We are explorers.