

**As Prepared**

**REMARKS FOR ROBERT LIGHTFOOT**

**SPACE TRANSPORTATION ASSOCIATION LUNCHEON**

**Dec. 12, 2017**

**Thanks to all of our Hill friends, industry and international partners for coming today. I always look forward in**

**December to giving you guys a rundown on what NASA has done in the year just passed.**

**[First, I want to report that CRS-13 is on its way to the International Space Station.]**

**When you see highlights of NASA's achievements over the year listed in one place, it's pretty amazing what we've been able to achieve.** Seeing so many challenging efforts become completed accomplishments is a testament to the determination of our entire extended NASA team. While I'm proud of what we did in 2017, another full plate of missions awaits us in 2018 that will surely inspire with their discoveries and technological advances.

And I do want to brag a little that for the **sixth year in a row, NASA has retained its standing as the number one large**

**agency in the 'Best Places to Work in Government' rankings**

published by the Partnership for Public Service.

I have to congratulate and **commend our amazing workforce** for

its teamwork and dedication, which has enabled so many

achievements in all our missions on behalf of the American

people and the world.

**It was a great year for public engagement, high profile events**

**and progress.**

**I'm going to take a few things out of chronological order here, but please bear with me.**

**Let me just start with two things already this week.** First, I was at the White House yesterday when President Trump signed Space Policy Directive 1, which marks a change in national space policy that provides for a U.S.-led, integrated program with private sector partners for a human return to the Moon, followed by missions to Mars and beyond.

**The policy calls for the NASA administrator to “lead an innovative and sustainable program of exploration with**

**commercial and international partners** to enable human expansion across the solar system and to bring back to earth new knowledge and opportunities.”

In addition to the direction to plan for human return to the Moon, the policy also **ends NASA’s existing effort to send humans to an asteroid**. The policy grew from a unanimous recommendation by the new National Space Council after its first meeting Oct. 5.

**The work will be reflected in our FY19 budget request.**

Today, we listed in the federal register the charter of the **Users'**

**Advisory Group (UAG)** a new federal advisory group to the

National Space Council to represent the expertise and

perspectives of non-federal aerospace organizations. Call for

nominations to the UAG will be available later this month.

So, yes, we have a **National Space Council** again! Council

members are government stakeholders in aerospace and defense

and, with the establishment of the UAG, we bring in industry,

academia and other voices.

I attended the **Council's first meeting in October**, where NASA **was charged with returning a plan within 45 days** outlining our future exploration objectives, including returning humans to the Moon. We are **working with the Council on our action**, and they are reviewing a preliminary draft of our plan.

I remain **pleased with the level of interest and engagement from the Space Council staff and Office of the Vice President.**

The White House's support of NASA in 2017 extended across the breadth of the agency, including:

- President Trump signing the **2017 NASA Authorization Act**  
in March
- The **President calling the International Space Station**  
from the Oval Office in April and U.S. record-setting NASA  
astronaut Peggy Whitson following her landing in  
September
- **Vice President Pence visiting NASA's Johnson Space**  
Center in June, **Kennedy** Space Center in July, and  
**Marshall** Space Flight Center in September; and **Lockheed**  
**Martin** in October to see **InSight**
- And of course, **SPD-1** just yesterday

I can barely even scratch the surface of the incredible list of highlights and accomplishments from this past year, but I quickly wanted to note that we've also been working on **several aspects of the NASA Operating Model**, which helps us improve how we do business. A few highlights of that work:

1. NASA has embarked on a **new way to fund our 12 critical aerospace wind tunnels**, which has led to a 50% increase in utilization by NASA test customers, and a substantial increase in innovation, risk reduction, and facility characterization testing. We've had numerous scale Space Launch System (SLS) risk reduction tests related to ascent

aerodynamics and dynamic pressure characterization; and Aeronautics sponsored quiet supersonic technology testing as part of its Low Boom Flight Demonstrator.

2. NASA continues to drive toward **more efficient and effective delivery of our Mission Support services**. After detailed assessments, the agency decided to develop a corporate model for managing our mission support functions, with a goal of achieving 25% savings. Examples include managing workforce training and our travel service for the entire agency rather than by 9 separate Centers.

3. NASA initiated **Capability Leadership** a few years ago, and we're seeing positive results. Most notably, we have recognized field center expertise in specific disciplines from materials to propulsion to electronic parts. Understanding our capabilities at an agency level led us to establishing Center Roles -- a master list of every center's primary and supporting role in technical and programmatic work that will enable collaboration across our community and reduce unnecessary duplication.

**All of this work, and work like it, has helped us to do things**

**like:**

**Solar eclipse outreach.** If I can, I'd like to start with an event that happened late in the year -- the total solar eclipse on Aug. 21.

While we didn't create it, we were able to get a whole lot of people engaged in it and thinking about science and our planet. It was one of NASA's biggest events ever online, with more than 50 million views of the live broadcast on NASA.gov and multiple social media platforms, and almost 31 million unique views on Facebook before and after the eclipse.

I was **privileged to watch the whole thing from a research plane** with Dr. Thomas Zurbuchen, our head of Science.

Heliophysics is his field, so I got a special perspective.

## **Solar System and Beyond**

- **Cassini** successfully ended its 13-year mission to Saturn on a high science note Sept. 15 with a fateful plunge into the planet's atmosphere. The mission transformed our understanding of ocean worlds, where life may potentially exist beyond Earth.

- Humanity's farthest and longest-lived space mission –

NASA's **Voyager 1 and 2** – celebrated **40 years** of science

findings and imagery on Sept. 5. NASA continues to

communicate with the spacecraft daily as they explore the

frontier where interstellar space begins.

- The **Parker Solar Probe was named** for a living researcher:

Eugene N. Parker. It's going to "touch" the Sun **next year**

**and explore our star's outer atmosphere.**

- NASA's **Fermi Gamma-ray Space Telescope detected the**

**first light ever tied to a gravitational-wave event.** NASA's

Swift, Hubble, Chandra and Spitzer missions, along with

dozens of ground-based observatories, later captured the fading glow of the blast's expanding debris.

- The **James Webb Space Telescope completed environmental testing** at Goddard and Johnson as it readies for assembly into a single spacecraft ahead of launch in 2019.
- The **Spitzer** Space Telescope revealed the first known system of **seven Earth-size planets around a single star**, with three planets located in the habitable zone. This event had incredible resonance across the world.
- NASA's Kepler space telescope team released its most comprehensive and detailed **catalog of exoplanet**

**candidates**, introducing 219 new planet candidates, 10 of which are near-Earth size and orbiting in their star's habitable zone.

- NASA's **OSIRIS-REx** asteroid sample return spacecraft successfully used Earth's gravity on Sept. 22 to **slingshot** itself on a path toward the asteroid Bennu, for a rendezvous next summer on its sample return mission.
- NASA **selected two new planetary missions** on Jan. 4 that have the potential to open new windows on one of the earliest eras in the history of our solar system. The **Lucy** mission will visit a target-rich environment of Jupiter's mysterious Trojan asteroids, while the **Psyche** mission will

study a unique metal asteroid that's never been visited before.

- Early science results from NASA's **Juno** mission to Jupiter portray the largest planet in our solar system as a **complex, turbulent world**, with Earth-sized polar cyclones and plunging storm systems that travel deep into the heart of the gas giant.

## **Mars**

In 2017, we celebrated **20 years of continuous robotic scientific exploration of the Red Planet.**

On Nov. 16, NASA selected a science instrument for an upcoming **sample return mission to the moons of Mars: a Japan-led mission** known as MMX.

### **Astronauts/SLS/Orion**

After receiving a record-breaking number of applications, NASA selected on June 12 women and men as the agency's **new astronaut candidates.**

The **first piece of completed Space Launch System rocket hardware** for the first test mission, Exploration Mission-1, was delivered to Kennedy Space Center for processing.

Flight **preparations are complete for the four liquid fuel engines that will help power SLS** on its first mission, and engineers began testing engines for the second mission, which will carry crew, Exploration Mission-2.

NASA finished manufacturing **all five parts of the SLS rocket's core stage**, to which the engines will be integrated.

The **10 motor segments** have been cast for the two solid **rocket boosters**, and they are on track to be ready for the first integrated test flight.

NASA has moved up a critical **crew safety launch abort test** for the Orion spacecraft in advance of the first launch with humans, and teams also have been testing the **parachutes** to bring the capsule to a safe landing as well as [exit procedures for the crew](#) after returning from a mission.

Meanwhile, teams **powered on the Orion** spacecraft for the first integrated test launch, and are busy **building the Orion capsule for the first crewed mission**.

At the future launch site for SLS and Orion, upgrades to the walls of the **flame trench** are complete as well as the installation of all the **work platforms in the Vehicle Assembly Building** where the rocket will be stacked prior to launch.

NASA continues to use its Next Space Technologies for Exploration Partnerships (**NextSTEP**) public-private partnership model to seek commercial development of deep space exploration capabilities. This year, NASA is seeking proposals for development of a first-generation, in-space, **multi-material fabrication laboratory, or FabLab**, for space missions; selected

five companies for studies for the **gateway power and propulsion element**; announced it will seek proposals for research contracts in **In Situ Resource Utilization (ISRU) Technology**; and its partners are **developing prototypes of habitat structures**.

## **International Space Station**

In 2017, six NASA astronauts have lived aboard the **International Space Station**, supporting more than **120 new U.S. research investigations**, including research leading to **new knowledge about combustion processes**, tests of a **drug to help fight**

**cancer**, and technology demonstrations like the **Bigelow Expandable Activity Module (BEAM)**.

Here are some additional space station highlights from 2017:

- The arrival of the Expedition 53 crew marked **the first long-term increase in crew size** on the U.S. segment from three to four, allowing NASA to maximize time dedicated to research.
- **Peggy Whitson broke multiple records** during an extended mission to the station, becoming the U.S.

astronaut who has spent the most total time in space,  
tallying 665 days during three missions.

- During **nine spacewalks**, NASA astronauts' work prepared for the arrival of future commercial crew spacecraft and upgraded the station's capabilities.
- During five missions in 2017, NASA's **commercial cargo partners** Orbital ATK and SpaceX **launched more than 32,900 pounds of critical supplies** to the International Space Station. With its splashdown in the Pacific Ocean following three resupply missions, the SpaceX Dragon

capsule also returned more than 13,000 pounds of research and equipment.

- **Commercial Crew Program** providers Boeing and SpaceX made progress on the **Starliner and Crew Dragon spacecraft and systems**, respectively. Boeing revealed its **spacesuit design** early in the year and conducted important **parachute and qualification tests**. SpaceX also unveiled its spacesuit, and worked with NASA and the Air Force to refine its **procedures to retrieve astronauts** from the water following a mission to the space station.

- **Sierra Nevada Corporation** successfully completed a **free-flight test of its Dream Chaser spacecraft**, meeting the final milestone of a space act agreement for the Commercial Crew Program. The test also supported a milestone in preparation to carry cargo and science investigations to the space station under the agency's next generation commercial resupply services contracts.
- NASA's space communications and navigation capabilities were upgraded with the August launch of the Space Network's **Tracking and Data Relay Satellite-M (TDRS-M)**, the third and final in the Space Network's space system that

provides near-constant communication links to Earth from the International Space Station, the Hubble Space Telescope, and many other missions.

## **Aeronautics**

Our Aeronautics innovators this year focused on **advances to safely move increasing numbers of people and cargo** more efficiently between airports aboard airplanes of all sizes, which burn less fuel, release fewer emissions, and fly both quieter and faster. Some of those milestones are laying the foundation for the return of the X-plane to NASA's research toolbox.

Here are some aviation research highlights realized in 2017:

- NASA-developed **systems to help air traffic managers and pilots more efficiently fly from departure gate to arrival gate** were demonstrated: the first near Seattle early in the year and the second at Charlotte Douglas International Airport beginning in September.
- Enabling commercial **supersonic passenger jet travel over land** is a key goal for NASA aeronautics. A preliminary design for such an aircraft was completed in

June, and information that will help quiet sonic booms was gathered during flight tests in Florida in August.

- The explosive demand for **Unmanned Aerial Systems**, or drones, has prompted NASA to take the lead in assisting government and industry in finding the safest, most efficient ways to **integrate these new aircraft into the airspace above us.**
- Testing **flexible wings**, reducing **noise from landing gear**, improving the **odds of surviving** a crash, **improving research** methods with optical fiber, and

deploying new hardware to **better test helicopters** are among the many other projects that saw results in 2017.

- One of the NASA centers that does a lot of aeronautic research, **Langley** Research Center in Hampton, Virginia, celebrated its **100th anniversary** this year.

## **Earth**

NASA's program to **turn Earth science data from space into life- and property-saving information** when natural disasters strike on Earth contributed to major hurricane, earthquake, and wildfire response efforts in 2017.

NASA Earth satellite data **revealed the formation of a massive iceberg** the size of the state of Delaware that split off the Larsen C ice shelf in Antarctica in July.

NASA's **use of the International Space Station for scientific studies of Earth continued to grow** with the launch of instruments to observe lightning and the protective ozone layer in February and another in December to track the Sun's influence on our climate.

## **Technology**

This year, NASA launched **several technology payloads to the International Space Station** and beyond, completed **two big-prize competitions**, and **demonstrated on the ground technologies** that may one day build and repair large structures in space.

Here are some of NASA's technology highlights for 2017:

- The Station Explorer for X-ray Timing and Navigation

Technology (**SEXTANT**,) will test – for the first time in space

– the use of pulsars to form a GPS-like system that can

support spacecraft navigation throughout the solar system

(included with the Neutron Star Interior Composition Explorer (NICER), operating from the exterior of the space station.

- On Nov. 12, **two small spacecraft missions**, which launched aboard the Orbital ATK CRS-8 Cygnus resupply mission to the International Space Station, will test the **high-speed optical transmission** of data and small spacecraft proximity operations, and **demonstrate a reflect array antenna** that increases downlink data rates for CubeSats.

- **Centennial Challenges**

- In August, Team Foster + Partners of Chattanooga, Tennessee won first place and a prize of \$250,000 for successfully completing Phase 2, Level 3 of the **3D-Printed Habitat Challenge**.
- **Cube Quest Challenge** awarded \$20,000 each in prize money and secured space to launch the three winning teams' CubeSats on Exploration Mission-1.
- In addition to these challenges, Centennial Challenges' other active competition is the **Vascular Tissue Challenge** to advance the field of tissue engineering.

- NASA and its commercial partners are well on their way to demonstrating technologies that can manufacture, assemble and repair large structures in space through the **In-space Robotic Manufacturing and Assembly (IRMA)** projects.

## **Public Engagement**

- More than **five million people interacted with NASA at events** like South by Southwest; Philadelphia Science Festival; and the Consumer Electronics Show; among many others.

- **NASA's social media presence continued to grow in 2017** with more than 130 million total followers across all accounts and platforms. The agency has the most followers of any agency or department in the federal government on Facebook, Instagram, Twitter, Snapchat and Google+.

## **Looking Ahead**

While we await the appointment of the next NASA administrator, **we're in good shape across the board.** We're making progress in commercial space as well as deep space missions. Science is igniting interest in our work across the globe. Aeronautics is

improving our aviation systems, and technology is helping us make the next breakthroughs.

We've had an **incredible 2017, and looking ahead**, next year we're going to send **InSight** to Mars to study the core of the planet, and the **Parker Solar Probe** to get closer to the sun than ever before. We'll launch **TESS** to continue hunting for exoplanets. **OsirisREx arrives at asteroid Bennu** to begin mapping in advance of its sample retrieval. We're going to advance work on **commercial supersonic flight**, and mark more **milestones toward commercial crew and the first flight of SLS and Orion**. We're going to celebrate **60 years of America in**

**space** with the anniversary of Explorer 1's launch in January, and

**NASA's 60<sup>th</sup> birthday** next October.

It's an exciting time, and I'm happy to take your questions.