

**As Prepared  
REMARKS FOR ACTING ADMINISTRATOR  
ROBERT LIGHTFOOT  
SPACECOM  
Dec. 5, 2017**

Thanks for inviting me to speak. **SpaceCom represents an important nexus of government and commercial interests in space exploration**, as well as broader discussion across many industries working toward new ways of doing business and exploring new frontiers.

I know you're going to hear from a lot of knowledgeable folks over the next few days, so **I'm not going to get too far down in the weeds**. What I do want to convey to everyone, which won't be

news to you, is that **we live in a very exciting time for exploration and for innovation on many fronts.**

**In space, it's a watershed time** as commercial space comes of age, and we've reached broad consensus in government and among the public and stakeholders worldwide about our horizon goals of the Moon and Mars.

**Humans are venturing back to deep space, indeed to farther destinations than ever before.** NASA has been making tangible progress on the Space Launch System rocket and Orion spacecraft in which humans will travel on those missions. From

Mississippi to Utah, you could have seen SLS rocket booster and engine tests this year. In Virginia there have been water drop tests of Orion, and in Yuma, Arizona, our parachutes have opened.

Closer to home, it took a lot of groundwork, and some setbacks over the past decade, but **I don't think there's any stopping commercial space now.** Let me just say up front that private sector companies are essential to our space exploration goals, producing major benefits for humanity, and enabling our return with humans to deep space. And they've reinvigorated America's launch industry even as our partnerships are developing a robust

market in commercial space that is not solely dependent on NASA.

**Later this week, SpaceX will set out on its 13<sup>th</sup> contracted cargo resupply mission** to the International Space Station.

Dragon will carry a Fiber Optics payload, which will test manufacturing of fiber optic filaments in a microgravity environment. This could lead to production of higher-quality fiber optic products both in space and on Earth.

The mission also launches an **investigation using synthetic bone material to accelerate bone repair**. The **Total and**

**Spectral Solar Irradiance Sensor (TSIS)** is a new instrument

launching to station that will measure the Sun's energy input to

Earth. **The Space Debris Sensor** is an external tool that will

measure the orbital debris environment around the space station.

We're also going to be testing **drug delivery systems for**

**combatting muscle breakdown in microgravity.**

This mission also launches on the **first re-flown Falcon 9 used**

**on a NASA mission**, using the **Dragon originally used on CRS-**

**6**, and launches from a **refurbished Launchpad 40.**

**Last month, Orbital ATK launched a similarly amazing**

**mission** as its 8<sup>th</sup> contracted mission sent a Cygnus spacecraft to

the ISS. Cygnus will be released from the ISS tomorrow morning (Dec. 6), and the following day will deploy 14 CubeSats from an external Nanoracks deployer. I don't think I have to tell a lot of you here how much CubeSats have advanced and made space accessible to so many, from students to researchers and industry.

Sierra Nevada Corporation's Dream Chaser has been passing crucial milestones -- like its recent free flight glide and landing -- meeting the final milestone of a space act agreement for the Commercial Crew Program and supporting a milestone in preparation to join the commercial cargo arena. Also in in commercial crew, both Boeing and SpaceX are marking their own

milestones as they work to launch astronauts from American soil once again. Over the past year, we've seen both companies introduce the spacesuits astronauts will wear en route to the space station on commercial crew missions. And they've carried out important tests required for certification.

The station itself is moving toward more commercial involvement in operations. For instance, the **Research, Engineering, and Mission Integration Services (REMIS)** contract we awarded in September, is a multi-award contract for industry to help us get the products and services we need for research and engineering aboard station.

The Bigelow Expandable Activity Module, you probably know it as **BEAM**, was expanded on station in May 2016, and will now remain attached to the ISS for additional time to provide more performance data on expandable habitat technologies and enable new technology demonstrations in support of both NASA and Bigelow Aerospace's goals.

On the ISS, we're not just about cargo, but about tech demo and development and helping industry innovations to do their thing in space. As I mentioned, deployment of CubeSats and other small satellite payloads from the space station by commercial

customers and NASA has increased in recent years, and to support demand, NASA has accepted a **proposal from NanoRacks to develop the first commercially funded airlock on the space station** – a step in creating a new economy in low-Earth orbit for research, tech development and human and cargo transportation. Our hope is that the new airlock will allow a diverse community to experiment and develop opportunities in space for the commercial sector.

**So, the business of exploration, and the business of science and innovation, is strong.** When we started on this journey, I think the fact that we would routinely be launching amazing things

like those I just mentioned and what's aboard the next SpaceX cargo mission would only have been part of our wish list. But now we're meeting the stations basic needs and using it to its full unique potential as well. And as I mentioned, we're on the cusp of returning human launch capabilities to American soil.

The Center for the Advancement of Science in Space, or **CASIS** as you all know them, administers the ISS National Lab part of our work, which accounts for half of the crew's research time on station. And the current level of research aboard the station is at an all-time high.

All of that is part of **our strategy, where the station and LEO are key**, integrated elements of our overarching path.

To get on that path, we've been working on **transforming the way we do business** for a number of years now. We've had a lot of success, in large part due to the very things that are being discussed and showcased at SpaceCom – commercial space, technology transfer, and partnerships.

It took **slow and steady progress to evolve our systems, our culture, and our activities** beyond a three decade flagship program and develop the stepping stone approach to making LEO

a vibrant commercial space, as we reach to the Moon and Mars and other destinations and seek commercial help there as well.

To give you some more tangible examples: NASA has **public-private partnerships with multiple companies through our**

**Next Space Technologies for Exploration Partnerships**

**(NextSTEP)** program to develop habitat concepts and systems.

We've selected 12 projects to advance the development of necessary deep-space exploration capabilities, specifically in the areas of advanced propulsion, habitation systems and small satellites.

In November, NASA selected five U.S. companies to conduct four-month studies for a power and propulsion element that could be used as part of the deep space gateway concept. These studies will provide data on commercial capabilities as NASA defines objectives and requirements, as well as help reduce risk for a new powerful and efficient solar electric propulsion technology in deep space. NASA potentially will seek an in-space demonstration for power and propulsion capabilities, and late last month, the agency also issued a Sources Sought Notification for this activity.

Just this week, we asked for proposals to advance critical in situ resource utilization capabilities for producing oxygen, water and methane fuel from the Mars atmosphere and soil from deep space destinations such as the Moon and Mars.

**This partnership model enables NASA to obtain innovative concepts and support private industry commercialization plans for low-Earth orbit.**

On the technology front, our **Space Technology Mission Directorate** has developed a diverse technology portfolio,

creating a pipeline to solve the nation's most difficult challenges in space.

Since its inception, the **Flight Opportunities program** has helped to test and mature 126 technologies through 151 flights.

This coming spring, the program's vendor UP Aerospace's suborbital rocket will flight test NASA's **Adaptable, Deployable, Entry and Placement Technology (ADEPT)**, a heat shield designed to protect payloads and landers delivered to planetary bodies with atmospheres.

Since the **Centennial Challenges** began in 2005, there have been 18 challenges, resulting in more than \$8 million in prize money awarded to more than 60 teams from across the country.

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**.

Active Centennial Challenges include: the **Cube Quest**

**Challenge** which is sort of a set of Deep Space & Lunar Derbies to design, build and launch flight-qualified, small satellites capable

of advanced operations near and beyond the moon; the **Vascular Tissue Challenge** to advance the field of tissue engineering; and Phase 3 of the **3D-Printed Habitat Challenge** to advance the construction technology needed to create sustainable housing solutions for Earth and beyond.

Our **Small Business Innovation Research (SBIR) / Small Business Technology Transfer (STTR)** program awarded 567 contracts for a total of \$172.5 million in FY 2017. That's a lot of resources for up and coming innovators, and we welcome their energy and perspective.

We also in **September announced 10 new partnerships with U.S. companies focused on space technologies that can advance the commercial space sector** in the areas of small launch vehicles, reliable electronics, advanced communications and in-space propulsion.

Since its inception in 2011, **NASA Innovative Advanced Concepts (NIAC)** has made 158 awards for a total of \$33.375M in project lifecycle costs – all geared toward transforming future NASA missions with the creation of breakthroughs. This past year, the NIAC made 22 awards across industry, academia, and NASA Centers.

STMD's 2018 "**Tipping Point**" solicitation, released last

Thursday, seeks industry-developed space technologies that can

foster the development of commercial space capabilities and

benefit future NASA missions in three "thrust areas":

- expansion of the utilization of space;
- enabling efficient and safe transportation into and through  
space;
- and increasing access to planetary surfaces.

And those are **just a few of the dynamic things going on right now at NASA**. We're working at being more nimble and more open to new solutions to our challenges.

I'm delighted that so **many of my friends and colleagues from NASA are here sharing what they're working on**. Our missions really embody where vision and reality converge. And SpaceCom demonstrates the full spectrum of our universe today, including small and large companies across a broad spectrum, as well as government, academia, and international partners.

When I look at our annual budget, when I see the diversity of activities and aspirations at a gathering like SpaceCom, it's clear that **we have to look at our work beyond the traditional “and/or” perspective.** NASA can't do everything, but we also don't have to exclude small projects because we have only flagships. We need both industry AND government in space exploration.

That **new way of doing business** involves industry and international partners on a greater scale – including non-traditional partners both on the international and the industrial side. We need commercial partners to succeed in low-Earth orbit,

and we also need the SLS and Orion to take us deeper into space than ever before.

We want **big contractors and small contractors. Institutional knowledge and the brightest young minds** that are full of ideas but also need training.

Right now, and for as far in the future as I can see, **we're going to need a huge number of dedicated talented people in pretty much every field and from many industries.** And frankly, I'm looking for our replacements. Those people have to be getting inspired and educated and trained right now. Because we're

going to need astronauts and mission controllers. Spacecraft engineers and scientists in all fields. Storytellers and program managers and administrative professionals. Not in the distant future, but soon.

Our exploration endeavor is a **grand canvas, and I think you only need to look around this room, and this conference center to see that.**

You know, maybe the **biggest way we've transformed is how we're looking at our future.** We all know how the work our agencies and companies and partners do is laying the

groundwork for a bright future, but when you really look at the societal changes we've brought about and are working toward, the impact is immense.

We're talking about **civilization-level game changers** here. I know that's a pretty big claim. But think about how much we're going to change, as the human race, when we actually get humans to Mars.

We all know that **the world on July 20, 1969 was not the same world it had been even a day before.** The whole world celebrated our success as a spacefaring species. But the

milestones of Alan Shepard and John Glenn and Neil Armstrong helped us become accustomed to the idea of leaving our planet.

**Right now, a person graduating high school this coming spring has never known a time when every single living human was walking the planet under the thrall of gravity.**

Because we celebrated 17 years of continuous human habitation aboard the ISS last month.

**Today's young people have a completely different mindset about what is possible and what they want to do.** I think we

have to take some credit for giving it to them, because a lot of us

in this room have been working hard, many of us for decades, to deliver a world where space travel looks easy. It's not, but it's something people can aspire to. Clearly a lot do, as evidenced by the 18,300 people who applied to be astronauts for our last class.

**And the aspiration knows no boundaries, either political or**

**philosophical.** Our astronauts -- to a person -- say they are

transformed by seeing our planet from orbit, where political

boundaries melt and the majesty of the oceans and the mountain

ranges and the outlines of our continents and the thin veil of

atmosphere define the human space on Earth. And the innovation

to go farther, the ideas for scientific missions, the drive to develop

the next robotic explorers and the technologies to enable humans to live and work in space for the long term – that’s happening everywhere.

**Coming up 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.

There's a lot going on, and **the dialogue here at SpaceCom is not just talk. It's real collaboration and partnership** and part of a conversation that is happening worldwide about our next giant leap as a species.

As the President has said, **American footprints on distant worlds are not too big a dream.** NASA is executing programs, step by step, to make this dream a reality, as part of our broader quest to explore and understand the universe.

**No matter if you work in space or a terrestrial industry, the collaboration and exchange and innovation at this conference is all contributing to that quest.** I thank you all for building those bridges across industries and disciplines and borders. It's going to help us create the future together.

**Thank you.**