Jim Bridenstine Testimony

Senate Space and Science Subcommittee Hearing

October 21, 2021

Chairman Hickenlooper, Ranking Member Lummis, and Distinguished Members of the Subcommittee,

It was my great pleasure to serve as the 13th Administrator of NASA. The men and women that serve our nation at NASA are the best America has to offer. I would also like to commend the Biden Administration and specifically Administrator Bill Nelson for their commitment to NASA's continuity of purpose. NASA's projects are multi-decadal and even multi-generational in nature. History has testified that whimsical shifts based on administration changes result in billions of dollars wasted and limited progress as our competitors and adversaries advance resolutely. Political leaders who care about exploration, science, discovery, and American leadership must constantly work to keep NASA outside of partisan political wrangling. I worked to that end every day and Administrator Bill Nelson has been working toward the same objective.

There are three specific challenges facing NASA with which this committee can help:
1. Human exploration in low Earth orbit
2. Orbital debris mitigation
3. Redundancy in America's Moon lander

Low Earth Orbit

It is absolutely critical that Congress fund America's replacement for the International Space Station (ISS), which has had humans onboard for over 20 years. The Chinese Space Station is on orbit, demonstrating great progress, and attracting international partners. Humanity is only at the beginning of understanding the immense economic, technological, and medicinal value of microgravity and America is at risk of ceding these capabilities to our greatest competitor. Congress must not let this happen.

America's advantage is its capital markets that are funding commercial human habitation and the brilliant entrepreneurs that are putting that capital to work. While the future of human spaceflight in low Earth orbit (LEO) is commercial, the United States Government has an interest in ensuring the success and steering the direction of these capabilities. Congress needs to fund NASA's LEO commercialization efforts at $2 billion per year. This money should be used for development and demonstration of LEO habitation as well as establishing NASA and its partners as ongoing customers of commercial LEO habitation. If Congress does this, capital markets and entrepreneurs will respond in a way that establishes America as pre-eminent in LEO human spaceflight at a cost significantly less than the ISS.

Once LEO commercialization is funded, Congress should require NASA to establish a date for the transition to new space stations with a plan to ensure there is no gap in American human spaceflight in low Earth orbit.

Space Debris Mitigation

Satellite communications are advancing rapidly and will be transformative for humanity. New constellations in geostationary orbit (GEO) are breaking records for capacity and throughput, while drastically dropping the cost per megabit. Constellations being developed for low Earth orbit (LEO) could complement these systems by delivering low latency communications allowing for applications such as tele-robotics and video gaming. Global, hybrid networks (GEO and LEO) will soon deliver additional benefits to online education, telemedicine, mobile banking, and economic opportunity for people around the world waiting to connected.

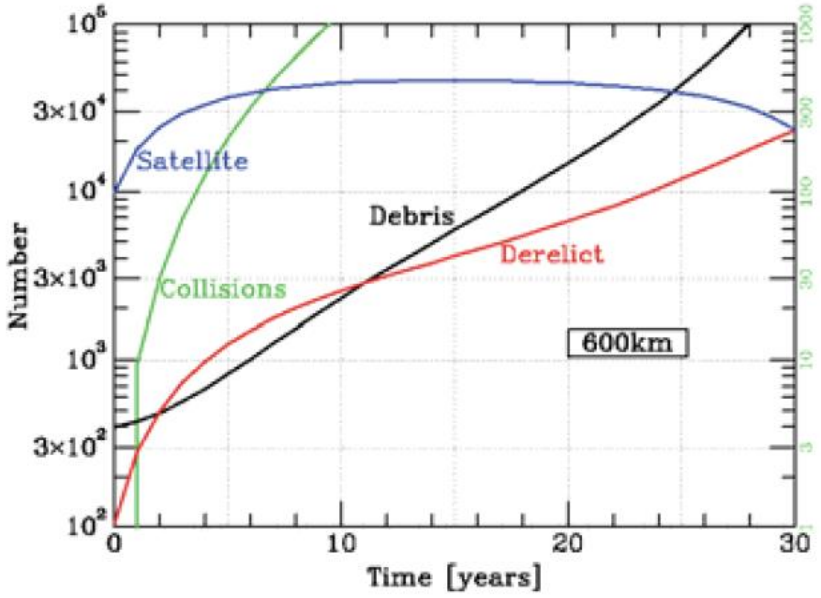
However, the US government and governments around the world are failing to properly manage collision risk. If not remedied, the consequence will be losing access to space entirely, devastating not only satellite communications, but also human spaceflight, national security, weather prediction, disaster relief, climate science, and so much more.

The challenge is that we are beginning an era of large, multi-satellite constellations when FCC rules on debris mitigation apply on a satellite-by-satellite basis. Requiring a failure probability of less than 1/1000 over 5 years makes sense for a single satellite. However, if 40,000 satellites are launched into the same orbital shell, each with a probability of failure of 1/1000, there will be 40 failures on average. In short, the current requirement for low probability of failure becomes the inevitability of numerous failures.

The problem becomes much worse when considering collisions. A study by the MITRE Corporation, commissioned by the National Science Foundation (NSF), suggests that it will not be feasible to operate some of the LEO systems being planned. That study predicts the effects of a LEO system that plans to include over 40,000 satellites at an altitude of about 600 kilometers.

As shown in the following figure from that study, dramatic increases in space collisions, and new space debris, are expected within just a few years. In the longer term "satellites are destroyed [by debris and collisions] faster than they are launched."[1]

[1] G. Long, The Impacts of Large Constellations of Satellites, JASON – The MITRE Corporation, JSR-20-2H, November 2020, (Updated: January 21, 2021), at 97, available at https://www.nsf.gov/news/special_reports/jasonreportconstellations/JSR-20-2H_The_Impacts_of_Large_Constellations_of_Satellites_508.pdf



The challenge increases drastically when considering that there are dozens of companies in the United States building constellations all desiring access to LEO. Additionally, China, Russia, Europe, and individual European countries have announced they will be deploying LEO constellations as well. The United States can and must take the lead on creating responsible rules that others in the international community can emulate to mitigate this growing concern.

Space situational awareness and space traffic management (SSA/STM) are important long-term requirements. However, if we don't take action now to mitigate the debris problem, there will be no need for SSA/STM. Space will no longer be accessible. I fully support the Commerce Department being responsible for SSA/STM, but given the immediacy of the problem, we need to use our current framework for mitigation.

Solution:
First, Congress needs to quickly require the FCC to approve satellite constellations based on an aggregate collision risk metric, not one satellite at a time. The FCC proposed this rule in April 2020, but it was never implemented. It was the right policy then and it is even more the right policy today.

Second, Congress must act quickly to require the FCC to define the limits on the nature and number of satellites that can exist in LEO. The FCC has said there are limits, but there has been no action.

Third, once those limits are established, there must be an effort to work with our international partners to appropriately allocate access to the highest value orbital shells. If other nations are not included in this process, they will claim the same territory with disastrous consequences. America's allocation must then be fairly distributed to companies in a way that ensures competition in the marketplace.

Finally, Congress should have the FCC analyze and report on the effects these constellations will have on launch, the International Space Station, the environment, astronomers, and future space exploration.

Artemis: America's Moon Program

NASA determined that it had insufficient appropriations to select two human landing systems for the Artemis program. Congress should appropriate sufficient funds for two human landing systems.

Dissimilar redundancy has worked exceptionally well in the Commercial Resupply Program and the Commercial Crew Program. When one contractor has a setback, the other moves forward, greatly increasing NASA's access to space and the International Space Station. This should be the approach for NASA's Human Landing System and Congress needs to fund it.

Additionally, if the goal is to eventually buy access to the Moon as a commercial service, NASA needs two providers that will compete on cost, innovation and safety. Having two providers will also incentivize the companies to get customers that are not the U.S. Government, lowering the cost to the taxpayer. As a matter of principle, the only thing worse than a government monopoly is a private monopoly to which the government is beholden. I am not suggesting that any specific contractor would intentionally act nefariously. I am suggesting that the government has an obligation to provide the right incentives to benefit the taxpayer.

Thank you for hearing my testimony. I am confident that with your leadership, NASA will continue to do amazing things for our nation.