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HEARING ON
SPACE MISSIONS OF NATIONAL IMPORTANCE:
PLANETARY DEFENSE, SPACE WEATHER PROTECTION, AND SPACE SITUATIONAL AWARENESS

BEFORE THE
COMMITTEE ON COMMERCE, SCIENCE AND TRANSPORTATION
UNITED STATES SENATE

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Thank you, Chairman Wicker, Ranking Member Cantwell, and members of the Committee. I am pleased to testify before the Committee to talk about the urgent need to improve space situational awareness (SSA). My testimony will cover the work the Administration is doing to address this urgent need, and the responsibilities that have been given to the Department of Commerce by the President and the National Space Council in Space Policy Directive 3 on Space Traffic Management. I will also discuss how the space environment is changing, the tremendous opportunities to leverage commercial capabilities to enhance space safety and sustainability, and why it is essential to do so in order to achieve our ambitious pursuits from space exploration to space commerce.

This hearing represents an important opportunity to discuss how our collective efforts will promote responsible U.S. innovation, investment, and space operations, and how commercial efforts can support our federal missions and the U.S. economy. The United States currently has an opportunity to capture the lion's share of an expected trillion-dollar space economy by 2040.

The Department's Direction to Establish an Open Architecture Data Repository (OADR)

Space Policy Directive 3 (SPD-3) directs the Department of Commerce to develop a modern, open data repository as the place from which to ultimately provide conjunction notifications. This state-of-the-art open architecture data repository (OADR) will apply modern technology and business approaches to space situational awareness, providing conjunction analysis to private sector and international users.

The OADR will provide conjunction notification services for participating commercial and international space operators that exceed current federal models. Participating members will

serve as contributors to the augmented space situational awareness repository as well as reap the benefits of protecting their assets in space through better understanding of the space traffic environment.

We believe that innovations can be applied across the board, from sensors and analytic tools to new concepts of operations and warning systems.

The OADR will also be designed to include a platform where companies can interact with one another to create new commercial service offerings around space safety and sustainability.

This is also an imperative of sustaining American leadership in space. We have had extensive conversations with a number of U.S. allies about the OADR and their interest in participation; our allies have offered to consider bringing civil and commercial capabilities into the OADR as part of their contribution.

The OADR will leverage commercial innovation to protect and enhance civil and commercial space activities in real-time.

A Very Near Miss in Space – One of Many

Our work on the OADR cannot be timelier, as space traffic expands and near misses are common news. On January 29, 2020, expert and even public attention was captured by the close approach between two space objects – a decommissioned U.S. space telescope (Infrared Astronomical Satellite or IRAS) launched in 1983 and a U.S. experimental payload (Gravity Gradient Stabilization Experiment or GGSE-4) launched in 1967. Throughout the day, probability of a collision dramatically increased from 1 in 1000 to 1 in 20, in other words an extremely close approach. To place this in context, satellite operators begin planning collision avoidance maneuvers for active space objects when the probability of collision reaches 1 in 10,000.

Neither object had any ability to maneuver. Thankfully, the two objects narrowly passed, by some calculations at only a distance of 18 meters. Some experts predict that if the two relatively large objects had collided, at a relative speed of almost 33,000 miles per hour, they could have created a debris cloud of up to 15,000 debris objects, one of the largest such events in the history of spaceflight.

Even if you followed the news reporting on that close approach, there are some things that you might not know. First, because the Department of Defense (DoD) national security mission of Space Domain Awareness prioritizes allocation of space surveillance and analysis assets at monitoring threats to active satellites and the International Space Station, DoD did not initially assign assets to this event (This was technically a “debris on debris” event). DoD did ultimately raise the priority for U.S. sensors as news of the possible conjunction broke. Second, LeoLabs, one of a number of innovative U.S. companies already providing space situational awareness services, provided the initial and subsequent warnings of the possible conjunction. Third, this close approach between two objects was only one of five similar events during that day.

Why Does it Matter?

This recent event, and many like it, demonstrates the risk that space debris creates for the astronauts on board the International Space Station and the billions of dollars of U.S. government and commercial investment, both in terms of spacecraft and in products and services delivered on Earth. It also creates risks for the space investments of many other countries, including our allies. As challenging as the current space debris problem is, however, Space Traffic Management is bound to become far more complex, given current and planned future space operations.

Let me elaborate. In 2020 alone, Space X and Europe's Arianespace have planned over twenty launches each. China is also planning over forty launches this year. Many of these launches are designed to release over twenty satellites. If the launch plans for Space X and OneWeb in 2020 go as planned, the two companies alone will launch over 1,000 satellites, all to low earth orbit. Looking ahead, three American companies have applied for licenses to launch a combined 57,000+ satellites over the next decade.

The problem is not confined to the launches of large satellite constellations: modern design practices for smaller commercial satellites may create vulnerability from smaller pieces of space debris. As Secretary Ross likes to say, even a paint chip travelling at thousands of miles per hour can do serious damage to a solar panel, fuel tank, or other critical part of a satellite.

As new missions like satellite servicing, space tourism, and commercial space stations emerge, they will critically depend on an increased ability to understand the space environment in order to ensure space safety and sustainability.

Analysts are projecting significantly higher probabilities of collision which, if they occur, will create space debris in and near operational orbits, potentially impacting the ability of commercial and government satellites to bring national and economic benefit to this nation for a generation.

One visceral response to this increased threat to space operations could be to limit launches or otherwise create a regulatory framework that might inhibit use of space in the hope of mitigating a crisis. This would be reactionary. In the Department's view, the best possible approach right now to ensuring that space is used in a safe and sustainable way is to better understand what goes on there. Only then can the best possible regulatory instruments be crafted to ensure space safety.

Unless we carefully consider the impact of regulation, space operators will simply take their investment capital, ingenuity, and potential space risk and launch from another country. Such an approach will allow us to ultimately drive right-sized regulatory requirements at federal and international levels.

Let's look at this problem in another way. Today's growth in space commerce is partly based on the application of commercial efficiencies to what was a traditionally government-focused

business model. The commercial launch industry has transformed the industry by implementing techniques such as launch vehicle reusability, miniaturization, efficient production, and continuous learning, which are resulting in the substantial lowering of costs associated with space access and operations. A failure to improve our understanding of the space environment and mitigate creation of additional space debris threatens adding costs and complexity once again. Space debris is the "speed bump" on the path to the trillion-dollar space economy.

Updating the Nation's SSA System – The Role of the Department of Commerce

SPD-3 directed the Department of Commerce, in partnership with DoD, to assume responsibility for private sector and international notifications worldwide. Two key rationales exist for this transition. First, DoD, through the Space Force, has been directed to provide freedom of operation for the United States in, from, and to space, and to protect the interests of the United States in the space domain in the face of rapidly changing threats. Second, as already mentioned, our current SSA system needs to be modernized in order to effectively coordinate activities in the rapidly changing space environment.

The focal point for all of these activities is the Office of Space Commerce (OSC). At the Secretary's direction, OSC has moved quickly to implement the Department's SPD-3 responsibilities. OSC's efforts begin with leveraging the many different capabilities within the Department.

OSC's work on improving SSA is focused in three key areas: improving standards and best practices, industry engagement, and the development of the OADR. In order to achieve these goals OSC first needs to have the right mix of critical mission staff.

Commerce has developed a strong and continuing partnership with DoD and U.S. Air Force officials, at both senior leadership and staff levels, to ensure a seamless transfer of these responsibilities. Last year, the Department detailed a senior Commerce liaison to the 18th Space Control Squadron at Vandenberg Air Force Base (AFB), California, where DoD is providing access to their current data, systems, and processes for Commerce's awareness. Commerce is also participating, sometimes as co-lead, in exercises, experiments, and war games designed to help understand how to integrate government and commercial capabilities. Secretary Ross visited Vandenberg AFB in late 2018 for a first-hand view of the current SSA system and has spoken on numerous occasions about the importance of improving space safety.

The Need to Incorporate New Technologies and Processes

For the past five decades, the operational support mission to satellite owners has been a mission of the Department of Defense. Drawing upon a range of radar and optical sensors designed for missile warning and other national security purposes, the Department of Defense maintains a catalogue of roughly 26,000 space objects larger than the size of a softball. The Combined Forces Space Component Command, an element of the United States Space Command, shares SSA-related data through a series of agreements with foreign military and domestic and

international civil and commercial space organizations. It also provides information for space operator and public use through the Space-track.org website. While this approach served us well for the space environment of the past, it will not serve us adequately for the future.

Why not? Our national SSA system has not kept up with modern technologies and organizational approaches characteristic of civil and commercial space operations, mostly because of the press of national security business. An improved understanding of the space environment will benefit from the application of new sensors, analytic and visualization tools, as well as a modern alerting and warning system. While these capabilities were initially developed via traditional government acquisition processes, today many of them are available in the commercial market. Some of these come directly from space-focused companies. Others come from the convergence of other technologies like machine learning and cloud computing. The Department and the Office of Space Commerce routinely engage with companies that have SSA-related sensor and analytic capabilities, as well as other companies that have ideas about innovative new services to help with space safety and sustainability.

The Department of Commerce's SSA-related relationships are especially strong with DoD and with the National Aeronautics and Space Administration (NASA). Commerce is currently evaluating the United States Air Force's Unified Data Library as an initial input to the future OADR, and we are working with the NASA Ames and Goddard Centers on their conjunction analysis tools and models of the space environment. Simultaneously, we are evaluating other technical and system architectural concepts.

We cannot neglect attention to the downstream analytics and notification parts of the enterprise. As national sensor capabilities expand with the activation of the Space Fence, satellite operators are concerned that they will receive an overwhelming number of conjunction warnings per day if analysis and reporting tools are not upgraded as well. This is likely to result in inaction. One overarching goal of all of our efforts under SPD-3 is to produce actionable warnings that are more precise, accurate, and timely in order to optimize satellite operator actions.

Looking forward: FY 20, FY 21, and Beyond-

FY2021 is a critically important building block year as we move toward achieving the goals of SPD-3. In FY2020, we have reprioritized our activities to ensure that significant strides can be made in our SSA-related activities.

With these core foundations set, FY2021 is an important year to continue our work on planning for the transition of SSA responsibility for on-orbit collision avoidance support from the DOD to a civilian agency. In FY2021, the Department is aiming to achieve some key milestones on our critical path for standing up the OADR on schedule:

I. Further developing the OADR design and our acquisition strategy approaches;
II. Engaging with federal agencies and the private sector on standards and best practices related to space safety and sustainability;

III. Conducting SSA development activities with industry; and

IV. Continuing to expand international partnerships for enhancing global cooperation on sharing SSA data.

However, to ensure that the OADR can provide these critical functions, even more needs to be done, as our mission and the need for the OADR is essential.

Conclusion

Mr. Chairman and members of the Committee, thank you for inviting me to discuss the Department of Commerce's vision for the OADR and the Office of Space Commerce. It is absolutely the right time to elevate our focus on how commercial innovation can enhance federal space missions and protect the billions of dollars that U.S. companies are investing in both traditional and paradigm-shifting space operations.

The Department appreciates Congress' ongoing support for these efforts, which have continued to ensure that the United States remains the flag of choice for space innovators and operators, and the ability for U.S. technology to drive dramatically improved protection of U.S. government missions and commercial assets. Thank you again for the opportunity to testify before the Committee today. I look forward to answering any questions you may have.