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THE HOUSE SCIENCE AND TECHNOLOGY COMMITTEE

***REGULATING SPACE: INNOVATION, LIBERTY, AND INTERNATIONAL
OBLIGATIONS***

STATEMENT OF

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Introduction:

Chairman Babin, Ranking Member Bera, and Members of the Subcommittee, I am pleased to join Ms. Montgomery, Dr. Dourado, Mr. Burnett, and Dr. Hogue today to talk to you today about issues and questions surrounding the possible need to regulate the burgeoning US commercial and entrepreneurial space industry. I come before you today as the former Deputy Assistant Secretary of Defense (DASD) for Space Policy, to provide you my view on the challenges of assuring continued US space leadership from primarily a national security perspective. But that perspective is informed by a sure understanding that strength in national security is inextricably tied to the health and vitality of US industry and that without a vibrant, innovative, and bold commercial and entrepreneurial space sector, the US risks falling behind peer competitors in the national security space realm. Given that by any measure space is integral to a modern warfighting force, that's a risk we cannot allow to take. So, thank you for the opportunity to speak to you today.

The Role of Commercial Space in Deterring Space Attacks:


Before I dive into the specific questions surrounding the potential need to better manage our new commercial space sector, I'd like to first lay out the reasons why this question is of utmost concern to those of us from the defense-side of space. As you are well aware, for the first time since the end of the cold war, US defense-related space capabilities are threatened. And the threats we face today are far more dangerous, and far more varied than those that we faced in the last decade before the end of the cold war. Back then, well before Desert Storm, the conflict in Bosnia and Kosovo (Operation Deliberate Force), and the current fights in Afghanistan, Iraq, and

Syria, national security space was barely integrated into US warfighting save for two specific mission areas—strategic indications and warning (I&W), and nuclear conflict. Our sole adversary in the use of space for those missions was the Soviet Union, and their counterspace efforts were underdeveloped and static. Counterspace capabilities were viewed solely from a nuclear perspective and space deterrence became a subset of nuclear deterrence. Further, the commercial space industry was still nascent and dwarfed by defense-related space investments. It focused solely on satellite communications, and was managed almost exclusively by international consortia backed by nationally sanctioned organizations such as the Communications Satellite Corporation (COMSAT) in the US. All these factors taken together meant that threats to space capabilities were exclusively a problem for the DoD and would be solved by the DoD. But today, all those facts have changed.

Today we find that space capabilities are fully intertwined into every aspect of US warfighting down to the smallest unit level. And threats to those capabilities are growing and evolving at an alarming rate, representing a huge range of possible modes including every known form of kinetic, electronic, and cyber-attack. As we analyzed this problem over the last four years, it became clear that if we were to be able to deter such threat, we would not be able to do it from within the confines of US military spending nor by following the development timelines associated with US military procurement. There was not enough money, and the threats were evolving too quickly. Luckily, we did not have to.

As the Cold War ended, our nation began to develop a commercial space industry which today outspends and out-innovates government sponsored space activities by a huge margin. Worldwide, commercial space activities today comprise a nearly \$280 billion enterprise, the large majority of which is based in the US. This compares to total US government space

spending of about \$45B¹. More importantly, commercial and entrepreneurial space activities are innovating in every aspect of the space enterprise including mission types, manufacturing methods, terrestrial infrastructures, and orbital domains. So, as we in DoD tried to figure out how we would defend US national security space interests against the threats that we saw developing, we realized that one of the primary pillars of that defense would be built on the success of the US commercial space sector. In short, DoD's conclusion became that the strength of the US commercial/entrepreneurial space sector was a key ingredient in the DoD's strategy to



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deter aggression in space and to defeat those threats if they were ever used. So, it was against this backdrop that I began to assess what steps DoD specifically, and the US government more generally, needed to take to assure that a vibrant, innovative, and bold commercial and entrepreneurial space sector would be there when we needed it.

Threats to a Vibrant US Commercial Space Market:

Having agreed that it was in the National Security interest of the US to encourage an innovative commercial space sector, it became clear to me that the role of government in general, and the DoD in particular, was to determine what measures we needed to put in place to assure that threats to their success were eliminated. Let me explain what I mean by “threats” and “measures”.

¹Source: The Space Foundation, *The Space Report 2016: The Authoritative Guide to Global Space Activity*

Early in the US’s commercial space launch journey, commercial launch firms and this committee recognized that unbounded liability for damages resulting from launch failure could have a devastating impact on that developing industry—that liability was a “threat” to growth of that industry. So, in 1988, and extended many times since then, Congress passed a Space Launch Liability Indemnification provision as part of the Commercial Space Launch Act—a government “measure” to deal with that “threat”. I don’t need to tell this committee that the launch liability indemnification regime has proved incredibly effective in advancing the US commercial launch industry².

There are similar threats with regard to space flight³, that is the part of a space mission after launch but before reentry, that present risks to our nascent commercial space flight industry, and just as in space launch, these also call for government-sponsored measures to avoid a potential devastating impact on this critical sector. But whereas a non-regulatory indemnification approach may have been the best solution for space launch, that solution may not be appropriate for space flight. To fully understand what measures government must take, we therefore need to understand the threats and how those threats may manifest themselves.

The most prominent “threat” to commercial space flight missions is space flight safety; but space flight safety must be broken down in three distinct problems: threats to the safety of the individual commercial system, threats to the safety of other commercial and government missions, and threats to the long-term viability of the orbital environment.

² See for example the Apr 2002 Study by the FAA and DoT, *Liability Risk-Sharing Regime for U.S. Commercial Space Transportation*

³ It is difficult to derive a simple term such as “space launch” to describe the wide range of mission-types that commercial industry has either already indicated an intent to invest in (such as on-orbit servicing, or space-based commercial situational awareness), or mission types not yet considered but certainly in the realm of the possible (such a refueling). I will use the generic term “space flight” to describe the mission space for these space missions, although the reality is that the “space flight” term is only a placeholder for any activities that can be undertaken while in orbit or even deep space.

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The threats to the safety of the commercial system is hardly the purview of government—it is a responsibility and province solely of the owner/operator/entrepreneur and simple and straightforward economic forces will assure that any individual owner will take prudent steps based on the value of his investment, the risks he is willing to undertake, and the risk tolerance of his investment stream

and customers. So government intervention is not required.

But this laissez-faire approach begins to break down as we examine the two other facets of space flight safety. In regards to the second issue, threats to the safety of other commercial and government space missions, few if any individual operators have the ability to either assess the risk their activities may pose to other space flight missions, especially US or other government missions, nor the resources or ability to ameliorate the damages their actions might have on those missions. And to ask them to try to develop those capabilities would be a greater constraint to their entrepreneurial activities than some well-designed government-sponsored measures.

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Further, since collision-caused debris in space causes a persistent, unbounded, and unknowable future harm, there is no credible way for industry to evaluate that risk. In other words, with regard to the second and third facet of space flight


safety, the necessary conditions for self-regulation are absent and external action is required.

At this stage of the discussion, and before moving on to other threats, it may be helpful to examine a real-life example that illustrates this issue and the potential role for government. In 2015 an entrepreneurial space flight firm applied for a government license for a constellation of satellites that it intended to launch. The mission of that constellation was such that government approval was required, and my former office led the national security assessment of risk from that space mission. As it turned out, the primary mission function of that constellation posed no risk to US national security interests and therefore, by the letter of the law, no national security objection would have been provided.

But, in the course of our analysis, we discovered that there existed a significant risk that was not part of the statutorily envisioned process, and that risk was a space flight safety risk to other US government satellites—specifically to US national technical means (NTM) satellites and to the International Space Station, both of which together represented an investment of many tens of billions of dollars on the behalf of the US taxpayer and for which no amount of money could replace the loss to those missions if a collision occurred. In fact, we calculated that if the entrepreneurial firm launched their entire constellation into a single specific orbit, as described in their license application, there was 100% chance in the next five years that one of those small, inexpensive, and individually expendable satellites would collide with a US NTM satellite worth billions of dollars. Let me restate that finding—a 100% likelihood of collision between a commercially expendable small-sat and a major US national security asset. Faced with such a predicament, I was forced to reach beyond the statutorily envisioned assessment of national security risk, and to expand that assessment to include space flight safety. Happily, we were well-acquainted with the entrepreneurial firm and able to engage directly with their President and

CEO. Together, we arrived at very minor modifications to their licensing conditions that had zero effect on their bottom line, but virtually eliminated the collision risk we had assessed.

However, while this tale ended well, under today's existing regulatory structure, things could have gone badly. In truth, we had no legally defined authority to compel the firm to alter or adjust their plans absent the kind of national security risks originally envisioned in the licensing process. Had they been unwilling to change, we could have ended up in a circumstance where the stark reality of a 100% collision existed. And while such a collision may have had a negligible impact upon the entrepreneurial system owner, the first order impact to US national security would have been grave. Even more worrisome, the impact to all future commercial space flight endeavors would have been catastrophic because such an occurrence would have led to a near paralysis in the entrepreneurial space flight market as the inevitable investigations into "who should have been in charge" and "who was to blame" dragged on. It is not difficult to



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envision that a collision such as described would have shut down the entrepreneurial space flight industry for years; and all that is even before we examine the impact to the orbital environment of thousand more pieces of debris circulating in previously economically valuable orbits, or if the collision occurred between a US commercial satellite and the military satellite of another nation.


This example presents a stark reality that reaches well beyond the specific instance cited in this case, and that reality is easily understandable—innovation in space can be constrained by many factors; financial, environmental, technical, regulatory, and others. Those constraints may be applied prospectively, as in the case of regulation, or reactively, as in the backlash from an unplanned collision. Both can harm innovation, but reactionary constraints are unbounded and uncontrollable, while prospective constraints are able to be analyzed and adjusted.

The International Dimension:

In the preceding section, I introduced the concept of “threats” to commercial/entrepreneurial space flight focused on safety. But there is another threat that, while far less devastating, could easily put US industry and national security at a distinct disadvantage, and that is the “threat” of foreign regulatory developments. While we sit here today and discuss appropriate or necessary measures that government should take to enhance the US commercial space flight industry, similar discussions are occurring in other national and international fora on exactly the same topic. Other nations are as concerned as we are about the potential of unmanaged commercial space traffic leading to collisions in space and the long-term pollution of the space environment. And so, they are beginning the process both internally and in international bodies to try to set down a set of guidelines on flight rules and possible regulation.

On the one hand, we might be tempted to say that we can ignore any such restrictions that we do not feel are in the US interest. But such a stance would ignore the global nature of the space flight market and possible negative impact that could occur if the US were the only nation that flouted such guidelines (for example, the refusal of other nations to launch US commercial missions or to allow their nation to lease services from US firms that did not support those guidelines). Rather, as in the case of air transport regulations decades before, it behooves us to

lead in the development of guidelines that advantage the US commercial market within the global space marketplace and then to propagate those guidelines internationally. By doing so we would protect our industry from the fallout of collisions caused by other nations' space systems



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and from an overeager international community to regulate aspects of space flight outside US interests. Bluntly, we should seek to develop US guidelines that advantage US manufacturers and US industry rather than try to deal with guidelines others develop that are not in our interest.

Where Now:

Over the course of this paper I have examined a limited subset of the reasons why it may be to the advantage of the US commercial space flight industry to support the development of guidelines, measures, or regulations that would help avoid and limit some of the “threats” to that industry’s success. And I have only scratched the surface. In my mind, the form that these guidelines take—government established regulation, industry standards, technical improvements in tracking, or a set of public-private best practices—is less important than the fact that we realize that some guidelines are required. While the ways to implement those common sense practices can vary greatly, everywhere from strictly enforced government defined flight zones, to commercially developed aids to precision orbital tracking⁴, it is clear that some measures are called for.

⁴ Reducing the error in tracking active space objects by two orders of magnitude from a 5-kilometer error to a 50-meter error would virtually eliminate the uncertainty bubble around most space missions that cause the vast majority of conjunction notifications.

In 1988 this committee found it in the interest of the commercial space launch sector to provide government sponsored liability indemnification as a means to kick-start an industry that had barely begun to “lift-off” (pun intended). We are in a far more advanced stage of development in the commercial space flight sector, and our rate of innovation is increasing. If we want that innovation to continue, and to protect it from the unforeseen and uncontrollable impact of a major space collision, international regulation, or other forces, we must begin now to develop the measures necessary for their continued success.