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SENATE ARMED SERVICES COMMITTEE
UNITED STATES SENATE

PRESENTATION TO THE
SENATE ARMED SERVICES COMMITTEE
UNITED STATES SENATE

Subject: Military Space Launch

Witnesses: Honorable Frank Kendall III
Under Secretary of Defense for
Acquisition, Technology and Logistics

Honorable Deborah Lee James
Secretary of the Air Force

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Chairman McCain, Ranking Member Reed, and distinguished Members of the committee, thank you for the opportunity to appear before you to discuss how we deliver national security space capabilities to the nation's warfighters and intelligence community (IC). These capabilities provide our nation decisive advantage in situational awareness, precision navigation and targeting, and command and control, and without assured access to space via reliable launch services, that advantage would be at risk.

Combatant commanders rely on space-based effects, including worldwide precision navigation, threat warning, protected strategic and tactical communications, for every military operation. Launch systems must provide assured access to space to ensure the benefits of space for military operations, diplomatic engagements, and the continued development of the economy. The loss of access to space would have an immediate and devastating impact on Department operations. Consequently, in today's increasingly contested space domain, the Department cannot depend entirely on only one source for critical national security satellites.

By way of background, the Department is both guided and constrained by public law in how we develop, sustain, and acquire national security space launch capability. The Department's number one priority in space launch is assured access to space, as codified in Title 10, Section 2273 of the US Code and the National Space Transportation Policy. Assured access to space as mandated by Title 10 requires "the availability of at least two space launch vehicles (or families of space launch vehicles) capable of delivering into space any payload designated by the Secretary of Defense or the Director of National Intelligence as a national security payload." Ultimately, this law allows for continued access to space should one system suffer a fleet-grounding event or otherwise become unavailable.

The Department utilizes commercial space transportation services to meet its requirements, as mandated by the Commercial Space Act (51 U.S.C. 50131) and currently procures launch services for National Security Space launches. The Department does not take ownership of any launch hardware and plans to continue using the launch service approach to manage the transition from use of the RD-180.

Historical Significance and Getting to Where We Are Today

In the early days of U.S. space exploration, government intellect and investment drove the development of launch capability it its entirety. The Gemini and Apollo programs in particular required systems with both the scale necessary for large payloads and the mission assurance standards for manned spaceflight. Industry provided significant contributions through cooperative research and development agreements as well as direct investment through traditional contracts, but the government was the prime integrator, and owned the design and the key technologies developed for heavy launch. This arrangement - where any changes driven by the payloads rippled through the designs of the rocket propulsion system and the rocket itself, and the government covered all of the costs – persisted until the Nixon Administration's decision in 1972 to merge the launch efforts of the U.S. government for defense, scientific, and commercial purposes in a single Space Transportation System (STS). A primary goal of the STS, or Space Shuttle, was to obtain cost efficiencies across the federal government through sustained launch rates of mostly reusable hardware.

Tomorrow marks the 30th anniversary of the Space Shuttle Challenger accident. Many of us remember exactly where we were on that cold January morning in 1986 when the nation mourned the loss of seven brave astronauts. In the wake of Challenger, the Air Force modernized

its expendable launch vehicle families—Atlas, Delta, and Titan—to launch critical national security payloads that would be grounded until the Space Shuttle returned to flight. The last years of the 1980s and the early years of the 1990s were spent launching these national security payloads on expendable launchers—as well as some remaining Space Shuttle launches—to meet the Department's growing need for space systems such as Global Positioning System (GPS) and Defense Support Program theater missile warning as demonstrated by their groundbreaking use during Operation DESERT STORM in 1991.

By the mid-1990s, the Department settled upon the Evolved Expendable Launch Vehicle (EELV) program as the path to establishing assured access to space. A large commercial launch market for commercial telecommunications satellites was expected to sustain the marketplace for multiple domestic U.S. launch vehicle providers so that the Federal Government could leverage economies of scale in a market-driven cost environment, and sustain alternatives should one launch vehicle family be grounded for any reason. At this juncture, The Boeing Company (Boeing) and Lockheed Martin Corporation (Lockheed Martin) were our two sources of launch capability in this class, but two events occurred that changed the landscape. First, a series of launch failures resulted in the loss of three national security payloads and more than $5.0 billion worth of hardware. The resultant failure investigations halted launch operations for nearly eight months, and reinforced the importance of access to multiple pathways to space.

Second, the commercial market did not materialize as predicted. To preserve the U.S. Government's assured access to space, in 2006 the U.S. Government supported the establishment of United Launch Alliance, a joint venture of Lockheed Martin and Boeing that combined the production of the government space launch services of the two companies into one central plant, and co-located engineering functions to improve cost efficiency.

Since 2006, much has changed within the launch industry and the global security environment. New sources of domestic supply, such as Space Exploration Technologies (SpaceX), have successfully demonstrated their ability to deliver payloads into space. New arrangements between government and industry, as witnessed by NASA's Commercial Orbital Transportation Services (COTS) and Commercial Resupply Services (CRS) contracts with Orbital Sciences (now Orbital ATK) and SpaceX, have shown that innovative public-private partnerships can be leveraged to obtain reliable space launch services at reasonable costs. New commercial applications of space, including large constellations in low earth orbit for persistent remote sensing and global internet services, are driving growth in projected launch demand. Finally, growing concerns with the acceptability and availability of Russian-supplied engines in the wake of the 2014 Crimean crisis have called into question the U.S. government's previous strategy of utilizing Russian RD-180 rocket engines for national security missions. Our strategy, in the early 2000s was to manufacture RD-180 engines for national security missions in the United States. We deferred co-production and ultimately moved towards a two-year stockpile of engines to mitigate disruptions to the supply chain. We are all in agreement with the need to end the use of the RD-180 with minimal impacts to national security as soon as possible.

Competition and New Entrants

As noted, competition between launch service providers both complies with the terms of the Commercial Space Act and serves as a way of controlling cost and spurring innovation. While government investment has traditionally driven technology development in this field, private sources of funding have now joined forces to spur a new generation of innovation in launch capabilities.

We remain optimistic about these new entrants to the market, and have contributed significant time, energy and expertise to help them develop their systems, understand customer needs, certify them for government applications, learn from their failures, and celebrate their successes. We look forward to working with these companies to continue to mature their capabilities. In the meantime, we remain dependent on the Atlas and Delta families as the only launch vehicles that can reach the full range of orbits and carry our heaviest payloads.

United Launch Alliance builds and flies the Atlas and Delta families for the US government and commercial customers, and they currently enjoy an unprecedented record of successful launches, 90 of which were accomplished under the EELV program. This exceptional achievement was accomplished with very high levels of mission assurance, including rigorous engineering review and component testing.

In this constrained budget environment, we believe that competition between certified launch providers on a level playing field is the best mechanism to incentivize the innovation required to do so. The simple fact is that the Delta family is not cost competitive, and with the restrictions on the use of Atlas, the Department must continue to look for alternative launch capabilities which are compliant with the law.

Statutory Challenges

Section 1604 of the 2015 NDAA requires that we develop a domestic next-generation rocket propulsion system suitable for national security use by 2019, that it be available for purchase by all domestic space launch providers, be developed using full and open competition, and that we examine the benefits of public-private partnerships to do so. We have examined the feasibility of public-private partnerships through the use of a Request for Information (RFI). The

Air Force released a RFI in August 2014 to solicit industry inputs on propulsion and launch systems. The conclusion from the RFI responses is that a solution at the propulsion level alone would not result in a launch vehicle solution capable of meeting the National Security Space (NSS) requirements. In contrast to the early days of space exploration, the US government no longer controls the technical baseline through ownership of the designs or integrating the launch systems. Shared investment with launch providers and competition for launch services—much like the original EELV program and the NASA Commercial Orbital Transportation Services (COTS), Cargo, and Commercial Crew programs—is the most cost-effective approach to transition from the RD-180, while ensuring the existence of two or more domestic, commercially viable launch providers that also meet NSS requirements by the end of FY22.

The Defense Appropriations for FY2015 provided $220,000,000 to accelerate rocket propulsion system development to fiscal year 2019. The agreement directs the Department, in consultation with the NASA Administrator, to develop an affordable, innovative, and competitive strategy for this development effort that includes an assessment of the potential benefits and challenges of using public-private partnerships, innovative teaming arrangements, and small business considerations. The strategy should include plans for targeted risk reduction projects and technology maturation efforts to buy down risk and accelerate potential launch system solutions.

Section 1608 of the 2015 National Defense Authorization Act (NDAA) restricts the use of the RD-180 rocket engine. Just as the Department complied with Congressional direction to incentivize industry to adopt the RD-180 in the 1990s, we are now taking steps to eliminate strategic reliance on Russian engines while maintaining assured access to space. As we testified last year, we continue to believe that provision of 18 RD-180 engines will be sufficient to

maintain a competitive environment during the transition period. The Department is committed to transitioning off of the RD-180 as quickly as possible while minimizing impacts to national security .

Launch services, not rocket engines

Assured access to space requires end-to-end space launch services and not just a rocket engine. As many Department of Defense witnesses have testified to this and other congressional committees, simply replacing the RD-180 with a new engine will not deliver the performance of the current design. To explain why, it is necessary to describe the relationship between a rocket and its engine, as well as how modern rockets are different from earlier launch systems.

To deliver a payload to orbit safely, rocket engines must release and direct tremendous amounts of energy in order to escape gravity, while protecting the payload from the shock and vibration unleashed by that energy. In the early days of space launch, the government owned the technical baseline, and built larger engines and heavier structures in the rocket body to handle the shock. However, this approach resulted in launch systems that were both inefficient and very expensive. Modern launch systems are designed to be more efficient, by reducing the weight of the rocket structure itself. To handle the stresses, every modern rocket is designed around its engine and the performance envelope defined by its payloads. For example, the Atlas V was built around the RD-180 engine to efficiently deliver a wide range of payloads into a variety of orbits. As a result, any effort to simply replace the RD-180 with a substitute engine would require extensive design and engineering changes, as well as significant dynamic and acoustic testing, and would ultimately result in a new launch system, which would require recertification.

United Launch Alliance and EELV Launch Capability

Consistent with the Commercial Space Act, the Department procures launch services rather than the individual hardware components used to provide those services. The Department does not have contractual control over ULA's internal allocation of RD-180 engines; therefore, ULA is in the best position to provide detailed information relating to the timing of ULA's assignment of the five RD-180 engines that meet the requirements of the FY15 NDAA without the need for a waiver. We understand that ULA seeks to minimize the inventory it carries and the time between engine testing and launch. Given this understanding along with the engine production timelines and launch manifest, both the Department and NASA do not believe ULA's decision to assign these five engines to support its current manifest was early to need.

The current EELV Launch Capability (ELC) arrangement is a contract option awarded as part of the EELV contract in 2006 to fund the fixed cost of maintaining ULA launch infrastructure critical to assuring access to space. The purpose of ELC was to ensure that ULA, as the sole launch provider at the time, could be ready to launch when critical national security payloads were needed, as opposed to waiting for a slot on a manifest. It accomplished this goal by stabilizing the engineering workforce, supporting launch infrastructure maintenance, funding costs associated with the Government's independent mission assurance process, and sustaining launch site operations. This approach was appropriate for the EELV sole-source environment, and resulted in both cost savings and increased flexibility for the government in scheduling launches. As we transition to a competitive environment, the Department has reached an agreement with ULA on the equitable allocation of ELC cost to each launch for the remainder of the contract duration, in order to ensure a level playing field for competing launch providers.

The current ELC structure will end with the completion of the EELV Phase I Block Buy contract, currently projected in FY2019.

Way Ahead

The Department delivered a strategy to the Congress in August 2015 that described our use of targeted risk reduction projects and technology maturation efforts to buy down risk and accelerate potential launch system solutions. Our objective is a more commercial model than the Department would normally follow. We intend to competitively select future launch service providers and to enter into tailored public-private partnership business arrangements that result in affordable, competitive launch services for national security missions. The exact form of these arrangements will depend on the needs of each of the selected launch service providers. The strategy also calls for the use of Other Transaction Authority (OTA) agreements, consistent with the FY 2016 NDAA, which broadens the use of OTAs. We plan to execute innovative teaming arrangements and joint investments with industry partners for launch system development (which is expected to include propulsion system development) consistent with the launch service provider's business needs and our launch services needs.

Unfortunately, at this time we are constrained by statute to work only on space propulsion engines. The Department would strongly prefer to not have to pay for the development of an RD-180 engine replacement that would benefit only one launch service provider. Consistent with this legal constraint, we are currently implementing robust risk reduction and technology maturation efforts covering propulsion system Material and Manufacturing Development, Advanced Technologies, Modeling & Design Tools, and Critical Component integration and testing through the use of Broad Agency Announcement awards,

which involve universities, NASA, and the Air Force Research Laboratory. We expect some of this work will transition into the launch service provider public-private partnership agreements we intend to award in FY17.

In order to transition from the RD-180 and ensure the Department has at least two viable domestic launch service providers for assured access to space as quickly as possible, we must shift from propulsion development to launch capability development as soon as possible. The Department would greatly appreciate the committee's support for our planned launch service acquisition activities.

Conclusion

Mister Chairman, Mr. Ranking Member, Members of the Committee, the Department is committed to transitioning off the Russian RD-180 rocket engine. We must maintain assured access to space, and we believe a public-private partnership with launch providers is the best means to that end. Maintaining at least two of the existing systems until at least two launch providers are available will be necessary to protect our Nation's assured access to space. As we move forward, we respectfully request this committee allow the Department the flexibility to develop and acquire the launch capabilities our warfighters and Intelligence Community need. Thank you for your support.