STATEMENT OF
GWYNNE SHOTWELL
PRESIDENT & CHIEF OPERATING OFFICER
SPACE EXPLORATION TECHNOLOGIES CORP. (SPACEX)

BEFORE THE
COMMITTEE ON ARMED SERVICES
SUBCOMMITTEE ON STRATEGIC FORCES
U.S. HOUSE OF REPRESENATIVES

March 17, 2015

Mr. Chairman, Ranking Member Cooper, and Members of the Committee,

I greatly appreciate the opportunity to participate in this important hearing. SpaceX stands ready and able to provide access to space for the United States. Our mission, from day one, has been to leverage American innovation and technical know-how to provide the most reliable space launch systems in history. We are proud to have contributed—time and again—to providing a reliable and affordable ride to space for NASA and the world's most sophisticated commercial satellite manufacturers and operators. And we have now begun to provide launch services to a broader set of U.S. Government customers, including the United States Air Force. Notably, we successfully performed our first launch with the Air Force as a customer in early February. We use our all-American rockets – the Falcon 9 and, very shortly, the Falcon Heavy – to perform these missions. They are made in the United States by American workers with zero reliance on Russian raw materials, technologies or engineers.

The National Space Transportation Policy (NSTP) calls for two, independent launch systems capable of fulfilling the full spectrum of our national security launch needs. This is a sound and prudent policy. I will focus my testimony on a constructive approach to best honor this policy. Critically, honoring this policy should not include an extension of the timeframe under which the United States relies upon Russian rocket engines, nor should it include further financing Russia's military-industrial base. Given the state of world events, this is a dark path to even contemplate. National policy likewise should not include extending corporate welfare to U.S. companies in order to produce a new domestic rocket engine. There is a better path forward. To help the U.S. Air Force achieve assured access to space, SpaceX will provide an all-American launch system capable of fulfilling the full spectrum of our national security launch needs. And, for its part, ULA already has the launch systems to provide uninterrupted Evolved Expendable Launch Vehicle (EELV) services using its existing taxpayer-funded, domestic-engine powered Delta rockets and the Atlas V with those Russian engines that federal law already allows it to use. If ULA wants to transition to a new rocket, the United States taxpayer should not be required to fund it, and the Congress should not change federal law to allow more money to flow to Russia. Simply put, with the Delta and the Falcon lines, the United States already has two all-American rockets.

Since 1998, American taxpayers have spent more than $20 billion on the EELV Program, including nearly $2 billion on launch vehicle development and upgrades alone.[1] But we have not really gotten "assured access" to space. The Department of Defense has been forced to rely on a single, monopoly provider with ever-escalating prices. Its two vehicle systems share single points of failure – this is the opposite of "assured access" – and one of the vehicles is dependent upon a risky Russian supply chain subject to disruption, threats of discontinuation, and unilateral price hikes. In point of fact, the Nation is

---

[1] Department of Defense. "Selected Acquisition Report: Evolved Expendable Launch Vehicle (EELV) As of FY 2015 President's Budget." RCS: DD-A&T(Q&A)823-176. April 16, 2014.

currently flying only one heavy lift launch vehicle—a single point of failure for the largest and most critical of our national security payloads. And America has a launch program so expensive that untold numbers of new satellites that would have otherwise provided enhanced war-fighting capability were never developed, built or deployed. A capability not provided to the warfighter because of extremely high launch costs should be considered by this Committee to be a mission failure.

The EELV program is not fiscally healthy. It is now the largest single acquisition item in the unclassified Air Force space budget, comprising more than *53 percent* of all Air Force space procurement funding. In fact, the Air Force spends more on space launch today in the EELV Program than all of the other unclassified space programs combined. The GAO has year after year commented in depth on the problematic cost profile of this program.[2] In Fiscal Year 2015, this Congress was forced to appropriate in excess of $376 million per launch, while subsidizing ULA's fixed costs at more than $1 billion per year even if the company never launched a rocket.[3] Several recent cost analyses have determined the EELV Program will double in price over initial estimates to nearly $67 billion.[4] This sustained cost growth triggered multiple "critical" Nunn-McCurdy breaches, most recently in 2012 when the program exceeded 58 percent unit cost growth and subsequently was restructured to contemplate new competitors.[5] Indeed, a GAO report issued this month indicates that EELV's procurement cost increased *257 percent* from original program costs even though the total number of missions declined from 181 to 163, resulting in a unit cost growth of *270 percent* from $101.7M to $376.4M.[6]

Even as ULA has claimed to have achieved massive savings, the RAND Corporation reported just this year that: "EELV has extreme cost growth in four of the five metrics and has by far the largest estimated growth in dollars of [DOD's] space programs."[7] By contrast, SpaceX's Falcon 9 price for an EELV mission is under $100M—a $276 million per launch difference–and SpaceX seeks no annual subsidies to maintain our business. And, as the Air Force has stated repeatedly, SpaceX will be certified as an EELV provider no later than June of this year.[8]

Mr. Chairman, I appreciate this Committee's timely review of the EELV Program and the Nation's assured access to space policy. SpaceX fully understands the national security requirement to have two fully capable, dissimilar launch vehicle systems in order to assure access to space. The most rapid and cost-effective mechanism to achieve this capability is to expand competition, create proper incentives for industry to self-invest to meet customer requirements, eliminate American's reliance on Russian rocket engines as soon as possible, and end the practice of subsidizing launch services providers. To that end, I respectfully offer the following recommendations to this Committee:

---

2 U.S. Government Accountability Office, "DOD Needs to Ensure New Acquisition Strategy is Based on Sufficient Information," September 2011, 10-12.

3 Department of Defense, "Fiscal Year (FY) 2014 President's Budget Submission, Missile Procurement, Air Force." Apr. 2013. Vol. 1, 232.

4 Department of Defense OUSD (AT&L) ARA/AM, "Selected Acquisition Report (SAR) Summary Tables," December 2012, 6; U.S. Government Accountability Office, "Defense and Civilian Agencies Request Significant Funding for Launch-Related Activities," September 2013, 2.

5 U.S. Government Accountability Office, "Uncertainties in the Evolved Expendable Launch Vehicle Program Pose Management and Oversight Challenges," September 2008, 7; 20-21. U.S. Government Accountability Office, "Assessments of Major Weapon Programs," March 2013, 59.

6 Government Accountability Office. "Defense Acquisitions: Assessments of Selected Weapons Programs." GAO-15-342SP. March 2015. 77.

7 RAND Corporation, "Air Force Major Defense Acquisition Program Cost Growth Is Driven by Three Space Programs and the F-35A," 2014, 26.

8 Andrea Shalal, "U.S. Air Force secretary upbeat on SpaceX certification." *Reuters.* January 14, 2015. "James said it was not a question of 'if,' but 'when' the privately held company Space Exploration Technologies would be certified to compete to launch U.S. military satellites under the Evolved Expendable Launch Vehicle (EELV) program. The Air Force last week said it expected to complete the SpaceX certification by mid-2015 at the latest."

1) Maintain the limitation Congress passed in the FY2015 National Defense Authorization Act on the use of the Russian RD-180 rocket engines outside of the existing block buy contract, at a minimum. The United States Government should no longer finance the Russian missile industrial base with U.S. taxpayer dollars when American alternatives to the RD-180 engine exist today.

2) Achieve assured access through multiple providers with redundant, truly independent launch vehicle systems. Congress should continue to support real and continuous competition in the EELV Program, and not create an unfair competition by subsidizing one provider's efforts to develop new systems.

3) Eliminate payments—more properly called subsidies—under the EELV Launch Capability (ELC) contract line items that exclusively support the incumbent provider and properly account for such payments for any competitive solicitations in the interim to ensure a fair and level playing field, especially since these funds do not contribute to the true nature of assured access to space. The Department and this Committee have called for real, meaningful competition. That means eliminating the unfairness. All we seek is the right to compete in a fair competition. Just like reliance on the RD-180 engine, it is time for these subsidy payments to the incumbent to come to an end.

4) Structure any propulsion development effort to optimize public investment with a focus on propulsion technology development than can be used broadly rather than creating an engine that is relevant only to the incumbent already-subsidized provider. Any Government funds should be expended on ways that improve our propulsion industrial base and its ability to drive innovation, including technology demonstrations and upgrades to propulsion testing infrastructure.

I. SpaceX Today

SpaceX is the world's fastest-growing launch services provider. We are an American firm that designs, manufactures, and launches its rockets within the United States, with virtually no reliance on foreign vendors or suppliers and certainly no reliance for any major subsystem or component. SpaceX was founded in 2002 with the goal of dramatically improving the reliability, safety, and affordability of space transportation. We have made that goal a reality. Our Falcon 9 launch vehicle, which provides medium- to intermediate-lift capability, has a mission success record of 16 consecutive flights. The Falcon Heavy, an intermediate- to heavy-lift launch vehicle, will debut this year, with already contracted Air Force and numerous commercial flights soon to follow.[9] Both launch vehicles are powered by our all-American Merlin engines.

For more than a decade, SpaceX has developed reliable and affordable launch vehicle systems designed from inception to meet national security space (NSS) launch requirements as defined within the EELV Program. We are concluding formal New Entrant Certification for EELV Program missions by June of this year, if not before.

SpaceX has booked more than 50 launches valued at nearly $6 billion on the Falcon 9 and Falcon Heavy for a diverse and growing set of customers, including NASA, the Air Force, commercial satellite operators, and international governments. Most of these launches are set to be conducted before even the first competitive EELV mission will launch, firmly establishing our robust heritage. In fact, Falcon 9 will exceed the Delta IV family in flights to orbit by the end of next year. SpaceX is a profitable, robust

[9] SpaceX has Falcon Heavy launch contracts signed with the U.S. Air Force, Intelsat, Inmarsat, and ViaSat.

business; we invest these profits back into the company's manufacturing and launch infrastructure and into advanced research and development, including current and next-generation booster propulsion.

To date, SpaceX has achieved unprecedented reductions in the cost of launch and spacecraft development, all while achieving 100 percent primary mission success, scaling our production operations to be capable of producing 40 rocket cores and 400 rocket engines annually in 2016. We have aggressively developed next-generation rocket technology and are today the world's most prolific private producer of liquid fuel rocket engines. The Merlin rocket engine powering the Falcon family of launch vehicles is the only new American hydrocarbon rocket engine to be successfully developed and flown in the past 40 years. SpaceX has flown more than 160 Merlin engines on its missions, representing significantly greater flight heritage than any other rocket engine flying on U.S. launch vehicles today, including more than Atlas and Delta engines combined.

Meanwhile, we continue to push the envelope on rocket technology as we advance toward fully reusable launch vehicles, design the safest crew transportation system ever produced for American astronauts for our NASA customer, and test next-generation rocket engines. Critically, all of this innovation is occurring in the United States, and our launch vehicles (including engines and fairings) and spacecraft are made in America. We have never, nor will we ever, rely upon Russia for any element of the launch vehicle.

SpaceX serves the Nation's space program today by routinely resupplying cargo to and from the International Space Station (ISS) with our Dragon spacecraft, launching numerous Government satellites, and preparing to carry crew. We are single-handedly restoring America's competitive position in the global commercial space launch market, recapturing market share that the United States had surrendered to French, Russian, and Chinese competitors—in 2016, SpaceX will conduct more than half of the world's commercial satellite launches.

SpaceX maintains its manufacturing and engineering headquarters in Hawthorne, CA; a Rocket Development and Test Facility in McGregor, TX; and launch pads at Cape Canaveral Air Force Station (CCAFS), NASA Kennedy Space Center (KSC), Vandenberg Air Force Base (VAFB), and, soon, a commercial launch site at Brownsville, TX. We recently opened a satellite engineering and manufacturing facility in Seattle, WA. SpaceX maintains a nationwide network of more than 3,000 quality suppliers and partners, an investment in U.S. American industrial base when others are spending abroad. In fact, Mr. Chairman, a number of Alabama suppliers recently penned a public letter highlighting the importance of the commercial space sector to their ongoing operations.[10]

Recently, SpaceX announced that it had raised one billion dollars in a financing round with two new investors, Google and Fidelity. They join existing investors Founders Fund, Draper Fisher Jurvetson, Valor Equity Partners and Capricorn. This additional one billion dollars of private commercial investment will be used to support continued innovation in the areas of space transport, reusability, and satellite manufacturing.

II. SpaceX Reliability, Launch Operational Tempo, and Production Output

Mission success is foundational to SpaceX, as our flight history to date has demonstrated. The Falcon 9 is designed for the highest reliability starting at the architectural level. Because 91 percent of launch vehicle failures in the past two decades can be attributed to engine failures, avionics failures, or stage separation anomalies, the Falcon 9 and Falcon Heavy incorporate robust, fault-tolerant propulsion systems, avionics and controls systems with internal triplication and redundant harnessing, and a minimum number of

[10] Lee Roop. "Small Alabama aerospace companies urge Rep. Mo Brooks to support competition in industry." *Huntsville Times.* August 12, 2014. Available at: http://www.al.com/business/index.ssf/2014/08/small_alabama_aerospace_compan.html

separation events. With its nine-engine configuration, Falcon 9 features a unique engine-out capability, and is designed to permit the loss of up to two engines in flight without compromising the mission. The Falcon 9 is the only American rocket since the Saturn V with any engine-out capability; any other launch vehicle in the world, including those in the current EELV fleet, that encounters a major engine anomaly on ascent will almost certainly fail its mission.

Separately, SpaceX was the first private company in history to travel to and from the ISS. To do so, we first passed rigorous certification efforts by NASA to allow our Dragon spacecraft to berth with the ISS, a feat we have now successfully achieved six times. SpaceX has performed a number of missions for high-value commercial payloads as well, executing complex mission requirements. These include the launch and deployment of six satellites simultaneously for Orbcomm; the recent launch and deployment of the first two all-electric satellites to fly in space; and the successful launch—for the U.S. Air Force—of the Deep Space Climate Observatory (DSCOVR). SpaceX has accomplished a number of launches into very high geosynchronous orbit as well, requiring multiple second-stage engine burns.

Launch Vehicle Production

SpaceX's state-of-the-art headquarters and production center near Los Angeles, CA, spans nearly one million square feet. The headquarters contains the engineering team—design, manufacturing, and industrial engineering—and the production team and equipment for the Falcon launch system and Dragon spacecraft. Quality manufacturing is a core competency, and our ability to keep the majority of the supply chain in-house provides significant advantages, allowing SpaceX to avoid the pitfalls associated with single-source dependency for parts and giving us a competitive advantage in quality, cost and schedule control. More than 70 percent of each Falcon launch vehicle is manufactured or assembled at the SpaceX Hawthorne production facility.

With our existing facility, SpaceX is currently capable of producing 18 cores and 180 engines per year (a core is a booster with nine engines, similar to a Falcon 9 first stage). In 2015, we will be capable of producing 24 cores per year, and we are adding equipment to expand production capacity to be capable of producing 40 launch vehicle cores per year, as our manifest demands it.

Launch Site Operations

For launch capability, SpaceX currently maintains East Coast and West Coast launch sites at Federal Ranges, and is developing an additional private launch facility in South Texas to support our commercial launch service contracts. SpaceX is also reconfiguring Launch Complex 39A (LC-39A) at KSC to support Falcon 9 and Falcon Heavy launches, including manned missions for NASA by 2017.

This approach will, at no expense to the Government, add to the Nation's launch capability and reduce the risk of manifest congestion at SpaceX's existing launch sites at CCAFS and VAFB—the current Eastern and Western launch ranges used by NASA and national security space customers—allowing for a launch-on-need capability for the U.S. Government without conflict in priorities. Importantly, these launch infrastructure investments are being made without any burden on the taxpayer. By leveraging SpaceX's existing launch infrastructure and launch systems, the Government will not need to make any significant investments in new launch capability to support a new engine or launch vehicle.

SpaceX has demonstrated rapid, on-time launch as operational tempo increases this year to keep pace with customer requirements. Already in 2015, SpaceX has conducted three launches for four distinct customers in 50 days. We have an additional launch planned in the coming days for a commercial customer, and in early April we will launch another operational resupply mission to the International Space Station. These missions will be followed by a series of launches every month through the end of the year. Last year, SpaceX demonstrated a record turn-around time of 14-days between launches on our launch pad at Space Launch Complex 40 (SLC-40), CCAFS.

Test Site Operations
For test operations, SpaceX's 4,000 acre Rocket Development Facility in Central Texas includes 12 test stands that support engine component testing; design, qualification and acceptance testing of Merlin engines; structural testing of the first and second stages; and fully integrated stage testing for full mission durations. The state-of-the-art facility has remote and/or automatic controls and high-speed data acquisition systems, and post test data are available for analysis upon test completion. To date, more than 4,000 Merlin engine tests—including nearly 50 firings of the integrated first stage—have been conducted at the site's multiple test stands. Currently, an average of two static-fire engine tests is conducted there each day.

III. EELV New Entrant Certification

We have high confidence that the SpaceX Falcon 9 launch vehicle will be certified to launch national security space payloads no later than June of this year. As part of the certification process, we successfully executed three required certification launches during a five-month period between September 2013 and January 2014. Importantly, because all three missions were for commercial customers, they were flown at no cost to the taxpayer for the flights. In July 2014, five months after the third and final certification flight, the Air Force recognized all three flights as having met all mission requirements and qualified the flights under the EELV Certification Cooperative Research and Development Agreement (CRADA) executed with the Air Force.

It bears noting that the New Entrant Certification requirements that SpaceX must live up to vastly exceed the requirements that the Atlas V and Delta IV launch vehicles had to meet in 1998, prior to their ability to compete for and *be awarded* EELV launch service orders. In fact, Boeing and Lockheed were awarded multi-billion dollar contacts for 28 missions in 1998; Atlas and Delta would not fly for the first time until four years later, in 2002. Even today, most of ULA's Atlas and Delta configurations have either not flown or not achieved even the minimum number of launches to establish reliability—as the GAO reported, "only three [of ULA's] variants—the Atlas V 401, the Delta IV Medium, and the Delta IV Heavy—have launched seven times, proving production maturity according to an Aerospace Corporation measure developed for the program."[11]

Since completing our third certification flight, we have launched the Falcon 9 in this upgraded configuration 8 additional times for a total of 11 consecutive successes on this vehicle, excluding the first 5 successful flights of the Falcon 9 v1.0 launch vehicle. Under the CRADA, we continue working with our Air Force partner as we conclude the data and engineering analysis.

SpaceX has been committed from the start to supporting the warfighter and launching national security space payloads. We designed the Falcon 9 and the Falcon Heavy from the outset to meet the EELV design specifications, including the EELV Standard Interface Specification (SIS) and System Performance Requirements Document (SPRD), at no charge to the U.S. Air Force.

The certification process has benefitted both SpaceX and the government team. SpaceX recently contributed to the Broad Area Review of the New Entrant Certification Process that is expected to improve and streamline the process for future national security space New Entrant launch providers.

Above and beyond the baseline certification requirements, SpaceX has made a number of investments on its own that will enhance America's ability to access space, including:

[11] U.S. Government Accountability Office, "Assessments of Major Weapon Programs," March 2014, 63.

- Building and debuting a new launch facility at Vandenberg Air Force Base with a successful September 2013 Falcon 9 launch;
- Providing the Air Force with the ability to observe or receive data from our contracted commercial launch service activities;
- Securing and funding significant infrastructure upgrades of LC-39A to increase SpaceX's ability to meet a growing launch manifest and further reduce EELV manifest congestion; and
- Developing fully-commercial launch site in South Texas in order to reduce launch congestion for U.S. Government customers at the Federal Ranges.

IV. Assured Access to Space Policy

As previously discussed, despite Government efforts and many billions of dollars spent, the United States has not attained assured access to space. The existing policy, codified in federal law, requires that assured access policy and spending, at a minimum, achieve the following two objectives:

> (1) 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; and,
>
> (2) a robust space launch infrastructure and industrial base.[12] (emphasis added).

Contrary to these requirements, the Government does not today have two space launch vehicles capable of launching the full spectrum of national security payloads. Between the Atlas V and the Delta IV families operated by ULA, *only* the Delta IV has the heavy-lift capability required to launch the largest of the DOD's satellites. This means that if there are any anomalies that ground the Delta IV (as occurred most recently in October 2012), the Nation cannot launch any heavy satellites. *Even in its most powerful configuration, the Atlas V cannot fulfill this need.* While Boeing initially invested to meet the full-spectrum requirement in the EELV program, the Atlas vehicle sought and was provided a waiver.

SpaceX has self-invested the development of both the Falcon 9 and Falcon Heavy. Between these two systems, we will be in a position to support 100 percent of national security launch requirements. Coupled with the Delta family of rockets, for the first time in EELV Program history, the United States will have true assured access to space with two separate launch vehicle families, each of which can execute all mission requirements. This approach obviates the need for any additional Government investment in new propulsion systems, or long-term development efforts that will not result in renewed capability in the near-term. Further, such an approach eliminates the risks associated with continued reliance on the RD-180 engine.

Beyond the absence of two separate heavy-lift launch vehicles, there are single points of failure shared between the Delta and Atlas rocket families. As a direct result of the high cost of launch associated with the ULA family of vehicles, the Government funded the development of a common upper stage engine, the RL10-C, for both the Delta and Atlas vehicle families—to try to make them less expensive. While both families currently use variants of the RL-10 engine, the drive to a common engine has solidified the risk associated with a single point of failure, a risk the EELV Program was expressly created to avoid. As a result, an anomaly on either vehicle's upper stage likely would mean both would be grounded until the issue is resolved. This is a real and proven risk. Recently, such a grounding occurred, resulting in an eight month launch delay – again, the opposite of assured access.

[12] 10 U.S.C § 2273 (b)

Finally, the fact that all Atlas V variants utilize the Russian-supplied RD-180 engine runs wholly counter to the notion of having assured access to space. Reliance on this non-secure foreign supply chain has been an acknowledged national security risk dating back more than a decade. Due to national security and non-proliferation concerns, every national space transportation policy has required that U.S. government payloads are launched on space launch vehicles manufactured in the U.S., unless explicitly exempted. Further, to avoid dependence on foreign-made, major critical components such as propulsion systems, which could jeopardize, delay or disrupt national security space launches, the EELV program *specifically required* that any propulsion systems produced in the Former Soviet Union (FSU) be converted to U.S. production within four years after contract.[13] This was never done.

Originally, U.S. production of the RD-180 was scheduled to begin in 2003; this deadline was later extended to 2008. In 2006, as the 2008 deadline to establish domestic co-production of the RD-180 loomed, a Congressionally-mandated review under the National Security Space Launch Requirements Panel identified reliance on the Russian RD-180 as a "major policy issue." Despite this warning, ULA announced in 2008 that it had made the decision to discontinue the required co-production program because, effectively, it could not justify the "business case" of developing this capability, and the Delta IV could provide "assured access to space."[14] This decision came after "hundreds of millions of dollars"[15] of spending, funds that would later be billed to the Government according to a DOD Cost Analysis Improvement Group report.

Later, in 2011, the GAO quoted the Launch Enterprise Transformation Study as identifying the RD-180 engine dependency as a "significant concern for policymakers."[16] In response, ULA repeated claims that it has the know-how to manufacture the RD-180.[17] While this implicitly acknowledged the geopolitical risk of continuing to rely on its Russian supply chain, it also turned out to be less than accurate. In any event, it would take years and likely cost around a billion dollars in additional taxpayer investments, since ULA and its subcontractors failed to fulfill the initial domestic co-production requirement, sought and received an extension, and then had the requirement removed.

In short, a monopoly environment has failed to provide assured access to space—in fact, a monopoly environment worked against the assured access policy. It contributed to the absence of assured access by eliminating the requirement for two heavy lift vehicles and the requirement for co-production of the RD-

---

[13] William Perry. "Department of Defense Policy on the Use of Former Soviet Union Propulsion in Space Launch Vehicles. May 17, 1995. "The use of such FSU systems, components, or technology in U.S. launch vehicles used by DoD for national security missions shall be carried out so that access to space cannot be denied by the foreign supplier. . . FSU produced propulsions systems, components, or technology used in launch vehicles for national security missions must be converted to U.S. production within four years after contract award for Engineering and Manufacturing Development."

[14] In its statement, ULA said: "The decision was made to conclude the program, partly because of the commercial market downturn. The resulting lower launch rate did not provide a robust business case for building a U.S. production facility. Also, the standup of ULA means that we can offer our customers assured access through the ability to integrate Atlas V payloads onto Delta IV and vice versa. ULA will also continue to stockpile adequate inventory to service the Atlas manifest will into the future. . . If a serious supply interruption is ever experienced in the future, we know we can build the RD-180 engine in the United States." United Launch Alliance. "RD-180 Co-Production Successfully Concluded." September 2008. Available at: http://forum.nasaspaceflight.com/index.php?topic=14224.0

[15] Michael Gass, Statement before the Senate Defense Appropriations Committee. "Senate Appropriations Subcommittee on Defense Holds Hearing on National Security Space Launch Programs." March 5, 2014. U.S. Government Accountability Office, "Defense Space Activities: Continuation of Evolved Expendable Launch Vehicle Program's Progress to Date Subject to Some Uncertainty," June 2004, 8.

[16] Government Accountability Office. "Evolved Expendable Launch Vehicle: DOD Needs to Ensure New Acquisition Strategy Is Based on Sufficient Information." September 2011. 22.

[17] Ibid at 15.

180, prompting Government investment in single points of failure between the two vehicle systems. It is important to understand *why* the Government took these steps. First, it had no choice, at the time, as ULA was the only provider available. But, more importantly, the Government took these steps in an effort to reduce ULA's costs and prices. In other words, the high price of launching on "America's ride to space" effectively undermined the assured access to space imperative.

We recommend a change. Consistent with the initial goals of the EELV Program, real and continuous competition will ensure that in the event of a launch vehicle anomaly or national emergency, the U.S. still maintains its access to space with another independent launch vehicle capability. Indeed, an independent report by the MITRE Corporation in September 2012 affirmed that multiple providers will establish an "insurance for transition in case of performance failure."[18] Even without any anomalies, multiple providers with separate launch sites decrease manifest congestion at a time when DOD's launch needs are at their highest in years. The recently issued National Space Transportation Policy dictates that "competition among providers" is critical to "assure access to space for [the] United States Government."[19] Notably, the recent policy also removed the requirement that the Department of Defense continue subsidizing the fixed costs of United Launch Alliance through the ELC line item.[20]

V. The Problem of Russian Rocket Engines

As is now widely known, ULA uses the Russian RD-180 rocket engine to power the first stage of the Atlas V launch vehicle. The RD-180 is produced by NPO Energomash, a state-owned organization managed entirely by the Russian government, under the direct authority of Deputy Prime Minister Dmitry Rogozin, a close political ally to Vladimir Putin. Following Russia's invasion of Crimea and Ukraine, the United States Government issued sanctions against Mr. Rogozin and numerous others with direct connections to NPO Energomash.

In response, Rogozin threatened to discontinue supplying the RD-180 to the U.S. for military launches, and threatened to shut down U.S. GPS ground stations throughout Russia. Rogozin, who maintains a colorful Twitter account, taunted the United States, tweeting that the RD-180 was a "Russian broom for an American witch,"[21] a reference to American military and intelligence satellites; later, he suggested America should "delivers [sic] its astronauts to the ISS with a trampoline."[22] This, however, was not the first time—and it will likely not be the last time—that Russia has leveraged America's apparent dependence on the RD-180 as a bargaining chip in unrelated foreign policy disputes. In 2013, for example, the Russian Security Council threatened to cut off supply of this engine as the United States weighed in on Russia's contributions to the hostilities in Syria.[23] As for Rogozin, he issued a direct threat: "The US introduced sanctions against our space industry. God knows, we warned them: we respond to declarations w/ declarations, to actions w/ actions."[24]

---

[18] Wydler, Chang, and Schultz, 17.

[19] The Executive Office of the President, "National Space Transportation Policy," November 2013, 3.

[20] Mike Gruss. "New Space Launch Policy Emphasizes Competition." *Space News*. November 22, 2013. "Specifically, the new policy language no longer explicitly requires the Defense Department to fund the annual fixed costs of launch services providers. The previous version of the policy, released in 2004, called for funding 'the annual fixed costs for both launch service providers,' referring to Lockheed Martin and Boeing."

[21] Dmitry Rogozin. Statement on Twitter. April 3, 2014.

[22] Alan Boyle. "Trampoline to Space? Russian Official Tells NASA to Take a Flying Leap." NBC News. Available at: http://www.nbcnews.com/storyline/ukraine-crisis/trampoline-space-russian-official-tells-nasa-take-flying-leap-n92616

[23] "Russian Rocket Engine Export Ban Could Halt US Space Program," *RT*, 27 Aug. 2013, Web.

[24] Dmitry Rogozin. Statement on Twitter. April 29, 2014.

To address the issue of Russian reliance for space launch—an obvious and substantial flaw in the Nation's assured access to space policy—Congress passed legislation last year to gradually phase-out the use of Russian rocket engines for Department of Defense launches. Congress' bipartisan approach expressly permitted the use of the RD-180 engine for those engines previously ordered under the current block buy with ULA, which includes missions that will fly out through roughly 2019 or 2020.

Recently, ULA has strained to suggest that continued imports of the RD-180 are critical to ensure national security and launch important military satellites—and they have requested "legislative relief" to enable them to buy more Russian engines. This is despite the obvious incongruity of relying on Vladimir Putin and his already-sanctioned inner circle to give the ultimate "go for launch" for U.S. satellites that will support American warfighters and the U.S. intelligence community in the field.

It is also in direct contradiction to testimony former ULA CEO Michael Gass gave to Congress last year. When asked a direct question about the risk of relying on Russian rocket engines, Mr. Gass stated expressly that there was no national security risk even if Russia discontinued the supply of the RD-180 immediately. Specifically, he stated that "[a]t the United Launch Alliance, we have another product that is fully compliant and ready to support any of the missions. So, for the nation, we are *not at any risk for supporting our national needs.* We've always kept our ability to not to be leveraged in case of any kind of supply interruptions"[25] (emphasis added).

Further, Roger Krone, the former president of Boeing Network and Space Systems, said last year, immediately following Rogozin's threat to cut off the RD-180 supply, that "[w]e believe we can deliver on the block buy with the engines we have"[26] and noted further that it was "fairly easy" to move payloads designated to fly on Atlas V to fly instead on the Delta IV. According to *InsideDefense*, "Krone noted that the manifest changes could be made without *any adjustments* to the terms of the block-buy contract" (emphasis added).[27]

Ultimately, not a single additional RD-180 is necessary to ensure American access to space. Two American-made launch vehicle families, the ULA Delta IV series of rockets, and the SpaceX Falcon rockets, have the capability to fulfill 100 percent of the Nation's launch requirements. As noted, even ULA has acknowledged that the Delta rockets can execute 100 percent of military launches—including those within the block buy, without a *single change* in the terms of that contract.

Ending the reliance on the RD-180 is good national security policy, as questions continue to be raised about the contracting propriety involved in the sale of the engines and the financial beneficiaries in Russia of U.S. taxpayer dollars. In November 2014, Reuters released the results of an investigative report into sales of RD-180 rocket engine to ULA. As noted, the RD-180 rocket engine is manufactured by NPO Energomash, a state-owned corporation headquartered in Khimki, Russia. These engines are sold through a series of brokers to an entity called RD Amross, which is itself half-owned by an entity called International Space Engines, itself 100 percent owned by NPO Energomash.[28] In effect, it would appear that NPO Energomash is selling the engines back to itself, before passing them on to ULA.

---

[25] Michael Gass, Statement before the Senate Defense Appropriations Committee. "Senate Appropriations Subcommittee on Defense Holds Hearing on National Security Space Launch Programs." March 5, 2014.
[26] Amy Butler. "Boeing: No New Russian RD-180 Engines Needed For ULA Bulk Buy Deal." *Aviation Week.* May 13, 2014. http://aviationweek.com/space/boeing-no-new-russian-rd-180-engines-needed-ula-bulk-buy-deal
[27] InsideDefense.com. "Boeing Official: ULA Considering A Future Without Atlas V." May 14, 2014.
[28] Brian Grow, Stephen Grey, and Roman Anin. "Special Report: In Pentagon deal with Russians, big profit for tiny Florida firm." *Reuters* November 18, 2014. Available at: http://www.reuters.com/article/2014/11/18/us-russia-capitalism-rockets-special-rep-idUSKCN0J22BQ20141118 .

Reuters reports that after purchasing the RD-180 engines from NPO Energomash at $20.2 million per engine, RD Amross marks up each engine by $3.2 million prior to selling them to ULA for $23.4 million each. Over the course of the 29 engine contract through 2017, RD Amross will reap more than $93 million in profits. Reuters further reported on a 2011 Defense Contract Audit Agency (DCAA) report regarding RD Amross, and characterized DCAA's findings thusly: "Amross, the auditors concluded, was a middleman that did 'no or negligible' work. The audit characterized the…added costs as 'unallowable excessive pass-through charges.'"[29]

Beyond the connection with RD Amross, the Reuters investigation raised concerns about whom the flow of U.S. taxpayer funds was benefiting in Russia. Past media reports have revealed that NPO Energomash was experiencing persistent losses for years, directly due to the "mismanagement" by "unnamed former executives," and that the profits that were captured by "unnamed offshore intermediary companies," now understood in large part to be RD Amross.

Ultimately, Russian Deputy Prime Minister Dmitry Rogozin, has plainly indicated where some of the proceeds of the RD-180 sales to America go. Rogozin, who oversees all of Russia's space enterprise, recently consolidated under central state control, said publicly that the profit from sales of the RD-180 to ULA is "free money" that goes directly toward the modernization of Russia's missile sector.[30] In essence, these purchases are funding many of the very actions the U.S. Government is sanctioning Russia over, and likely contributing to Russia's ongoing violations of the Intermediate Nuclear Forces (INF) Treaty, about which this Committee has been rightly concerned.

ULA has announced in recent days that it will terminate its Delta IV rocket line—the one that uses an *American* engine, and its only vehicle that can execute the full spectrum of DOD launch requirements. Instead of flying payloads on an American vehicle, it would appear that ULA would prefer to use taxpayer money to "Buy Russian" and extend, rather than phase-out, America's dependence on this non-secure foreign supply chain for national security space launch.

As Chairman Rogers correctly has said: "You don't deal with a thug like Vladimir Putin by asking nicely. He breaks treaties, he invades countries and then stations his nuclear forces on their soil, and he cozies up to terrorist regimes like Assad's, North Korea's Kim Jong Un, and the mullahs in Tehran."[31] Simply put, assured access should not include an extension of the timeframe under which the United States relies upon Russian rocket engines, nor should it include further financing Russia's missile industrial base.

VI. From One Subsidy to Another?

Through the EELV Launch Capability, initially referred to as "assured access to space" payments, the U.S. Air Force and the National Reconnaissance Office (NRO) pay ULA approximately $1 billion per year through distinct cost-plus-incentive-fee contract line items. These payments cover most of ULA's fixed costs — for example, launch infrastructure, systems engineering and program management, launch operations, mission integration, base and range support costs, transportation costs, capital depreciation, and non-recurring engineering to name a few — for "up to eight launches" per year. These payments are

[29] Ibid.
[30] Dan Leone. "Notwithstanding Sanctions, ULA Standing By for RD-180 Deliveries through 2017." *Space News.* August 6, 2014. "Rogozin said, '[P]resently, the sale of engines [to the U.S.] benefits our engine-making enterprises in that they use the money for their own modernisation.' Rogozin added, according to the story, 'We need the most modern engines that produce more thrust. In order to design them, we need free money. This is why we are prepared to sell them.'" Available at: http://spacenews.com/41507notwithstanding-sanctions-ula-standing-by-for-rd-180-deliveries-through/#sthash.WDy66pzm.dpuf
[31] "Consequences for Russia's Arms Control Violations Act of 2014" introduced and sponsored by Rep. Mike Rogers.

in addition to the firm-fixed-price that ULA charges for EELV Launch Services (ELS) for each launch ordered through the block buy contract.[32]

Since 2006, when the EELV Program was transitioned to a sole-source procurement environment, the Government has made a number of taxpayer expenditures in an attempt to enhance the ULA launch vehicle systems. This spending includes:

- Hundreds of millions of dollars to upgrade the RS-68 engine on the Delta IV vehicles, an engine that was developed and flown on only one mission and for a vehicle that ULA has threatened to retire prematurely;
- Hundreds of millions of dollars creating a common RL-10 upper stage engine and a dual RL-10 upper stage engine configuration for the Atlas and Delta vehicle systems; and,
- Funding for new payload adaptors, launch site infrastructure, all or nearly all research and development, to the extent ULA conducted any.

ULA has announced in recent weeks that it plans to terminate all single core configurations of the Delta IV vehicles in 2018. To replace it, ULA has suggested it will develop a "Next Generation Launch System." While seeking authority to continue U.S. reliance on Russian rocket engines through the middle of the next decade, ULA is also requesting that the Government, at least in significant part, finance its new launch vehicle—effectively replacing the ELC subsidization from which it has benefited for the last decade, with a new form of subsidization where the taxpayer will foot the bill for a new rocket engine, new launch vehicle system, and new launch infrastructure.

Congress should reject this approach for a number of reasons; not the least of which is that it undermines assured access to space.

By prematurely taking all of the single core configurations of the Delta IV vehicle offline—rather than increase production, as it has expressly stated to Congress it could do without issue[33] to offset the Russian reliance and lower per unit prices through new economies of scale—ULA is attempting to create an environment to justify additional taxpayer outlays to support its business, needlessly. Because there is no "capability gap" today or in the near future, ULA is attempting to create one and force the consequences on the taxpayer.

Incidentally, this strategy reflects a reversal of ULA's previous "contingency plan" with the Department of Defense to assure access to space, which former ULA CEO Michael Gass undertook as the RD-180 supply became uncertain. *SpaceflightNow* reported that ULA had begun to ramp up production of the Delta vehicles in the days following Rogozin's threat to cut off supply: "[h]astening the pace of Delta 4 manufacturing could reduce its cost in the long run, perhaps bringing its price into parity with the Atlas 5, according to Gass. 'The premise right now in the price sheet is that Delta 4, by similar capability, is more [expensive] than Atlas, but those were prices based on a certain build rate,' Gass said. 'Now, we're going to accelerate the build rate, and the Delta prices will come down accordingly. How much? We've got to go negotiate how much.'"

---

[32] U.S. Gov't Accountability Office, GAO-14-377R at 24, Space Launch Competition (Mar. 4, 2014).

[33] Stephen Clark. "With questions swirling, ULA hastens Delta 4 production." *SpaceflightNow*. May 19, 2014. "Gass told reporters Monday the decision to ramp up Delta 4 rocket production was part of a contingency plan adopted by ULA under the U.S. Defense Department's policy of assured access to space, which led to the development of the Atlas 5 and Delta 4 rocket families in the 1990s. . . 'The first thing we're doing is making sure we're implementing that contingency plan, which includes the acceleration of Delta 4 production, so some of that work is underway,' Gass said." Available at: http://spaceflightnow.com/news/n1405/19delta4/#.VQS5t47F_9Y

Congress should insist that ULA, as with any competitor, fully finance systems to meet customer requirements, to the extent it wishes to be a viable competitor in the national security launch market. SpaceX has already proven that a viable global commercial launch market exists and more than justifies contractor investment in new systems. The real benefit of competition is not only true assured access to space, but contractor-funded innovation to improve product reliability, enhance customer service, and meet customer needs.

The incumbent has raised concerns as to whether the Delta IV can adequately compete with SpaceX. We question this assertion, especially since the taxpayer has spent hundreds of millions of dollars improving the first stage engine on Delta IV in an effort to improve performance and reduce costs. Clearly, the most cost-effective way to achieve true assured access to space is to keep the Delta program online, eliminate the ELC subsidy, and expand competition for New Entrants. This approach requires not a single dollar of additional Government investment and will result in assured access immediately.

VII. Congressional Rocket Engine Development Program

As a general matter, SpaceX supports sound U.S. investment in liquid propulsion technology development and test stand infrastructure that will benefit the entire industrial base. However, we remain concerned about the Congressionally-funded engine development program, as currently constructed. Congressional direction in the FY2015 National Defense Authorization Act calls for a rocket engine that will ostensibly be "universal" and available to all prospective launch services providers. This approach carries the distinct risk of continuing a long line of Government programs that have spent billions of taxpayer dollars without ever producing a viable flying space system.

In theory, the idea of a universal engine is appealing. In practice, such an approach will be costly and non-responsive to the demands of the commercial and Government launch markets. For there to be a "common" engine, all launch vehicles would need the same interfaces, the same fuels, and the same structural capabilities. No U.S. launch vehicle operating today could accommodate a "standard" rocket engine without significant and extremely expensive modifications, including redesign of the entire stage and likely the development of an entirely new launch vehicle, erasing existing system heritage and requiring costly multi-year EELV certification prior to first flight. There is no guarantee that such a single-engine solution would be reliable, easily manufacturable, or cost-effective.

Though never really achieved, the primary goal of the EELV Program has always been assured access to space. When the program was first established, DOD officials chose two different launch vehicles with two different propulsion systems. This choice served a dual purpose: first, to encourage individual contractor innovation without hamstringing companies to a single formal design; and second, to guarantee that an anomaly in one rocket system would not compromise any other. This requirement of at least two independent systems was later codified. A "common" engine solution runs counter to this goal. Even the most reliable rocket engines have anomalies, so the need for redundancy is clear no matter how advanced any potential engine looks on paper. This point has been made abundantly clear in the EELV Program. While it has achieved a tremendous record of success, there have been notable propulsion issues with its certified launch vehicles. With multiple independent systems, the entire national security launch enterprise need not be halted in the event of an anomaly on one. This is a real risk, as was demonstrated by the October 2012 upper stage propulsion anomaly on the ULA Delta IV. The launch vehicle was grounded for months while the issue was investigated.

Reliance on the Russian RD-180 engine has rightly produced deep concern and a desire for an all-American path to space. However, spending billions of dollars and eliminating proven vehicle heritage without any viable market demand is not the prudent approach. Instead, the DOD should encourage the use of the multiple *existing and fully capable systems* that today utilize American propulsion systems.

Any Government development funds should encourage independent technological development by multiple providers to promote assured access and affordability.

VIII. SpaceX Propulsion Capability

The Merlin 1D rocket engine—which is designed and manufactured by SpaceX and powers the Falcon 9 first and second stages—is a human-rated engine with high structural margins and a highly reliable, redundant ignition system. A hold-before-release system verifying nominal operations of the first-stage engine suite before liftoff has been successfully demonstrated multiple times. Rigorous qualification and acceptance testing from the component to the vehicle system level are part of SpaceX's "test what you fly" approach, and the company uses liquid-fueled engines and non-pyrotechnic, resettable separation systems that allow testing of actual flight hardware before flight. As noted, SpaceX does not rely on any foreign companies for critical components or subsystems.

SpaceX has acquired considerable propulsion design, manufacturing, test, and ground systems experience. The company is currently on its fourth generation of booster engines, which have included the Kestrel, the Merlin 1A, the Merlin 1C, and the Merlin 1D. SpaceX has also developed and Draco and SuperDraco engines which provide in-space and abort propulsion capability for Dragon. Nine Merlin 1D engines power the first stage of every Falcon 9 vehicle, and an additional Merlin engine modified for vacuum operation propels the second stage. When it launches later this year, Falcon Heavy will be the most powerful rocket flown since the Saturn V. As noted, the Merlin engine has now successfully flown to space 160 times (with 110 on the Merlin 1D), reliably delivering multiple payloads for U.S, Government and commercial customers to complex orbits. Due to the engine's highly manufacturable design, SpaceX is now producing 4 Merlin 1D engines per week, with current production capacity to produce 10 engines per week—far more than any other private rocket engine producer in the world.

While Merlin 1D is not a one-to-one replacement engine for the RD-180, the nine Merlin 1D engines that form the power source for the Falcon 9 launch vehicle provide significantly more thrust at lift off than the baseline Atlas V rocket and offer enhanced reliability features like engine-out capability. More than this, because the Merlin engine is made in America, the Air Force and other Government customers will have insight into its reliability and production—this is not possible with the RD-180, which ULA currently accepts on faith from the Russian government.

Leveraging our design, fabrication, and testing experience on the Merlin engines, SpaceX has already begun self-funded development and testing on our next-generation Raptor engine. Raptor is a reusable LOX/methane staged-combustion engine designed for high performance, cost effectiveness, and long life in high production volume. The engine utilizes a full flow staged combustion cycle, promising the highest performance possible for a methane rocket engine, while also delivering long life through new SpaceX technologies and more benign turbine environments. Raptor will likely be the first methane rocket engine flown on orbital trajectories and beyond Earth missions by any entity in the world.

Raptor will represent a fundamental advancement in propulsion technology. This staged-combustion system will not only be the most powerful engine flying in the world today, but also extremely efficient and reliable. It will achieve commercial viability through notable risk- and cost-reducing improvements in metallurgy and producibility, as well as revolutionary technologies enabling long term reusability. All of these features are crucial in ensuring affordable assured access to space for the United States. Rather than turning to decades-old technology developed to support last-generation launch systems, Raptor will advance the state-of-the-art and ensure the US remains the global leader in rocket propulsion technology.

Importantly, SpaceX capability to support all NSS missions is independent of Raptor development; Falcon 9 and Falcon Heavy together exceed the DOD's requirements and will not require external development funds related to this engine.

IX. Contractor-funded Innovation

SpaceX continually self-funds the development of new technologies to improve the reliability of spaceflight and significantly reduce its costs. The Falcon 9 is a product of our past innovations. Among many other features, it utilizes the most efficient hydrocarbon propulsion system in history (Merlin) and is the only rocket flying today with advanced engine-out capability, all while being the lowest cost medium-to-intermediate lift launch vehicle in the world. To take the next step, rockets, like airplanes, must be reusable, and SpaceX has been working aggressively, on our own dime, to make that a reality.

Reusability is the single greatest challenge in spaceflight today. Every rocket in the world is discarded after each launch. This practice is akin to throwing away an airplane after every leg of a trip; it's simply not sustainable in the long-term. SpaceX developed two test platforms to prove that a vertical takeoff / vertical landing (VTVL) launch vehicle was possible. Our Grasshopper and subsequent F9R-Dev, the largest VTVL vehicles in history, conducted 13 test flights at our McGregor facility between 2012 and 2014. These groundbreaking and highly successful tests proved out the flight software, landing legs, and various other technologies necessary for a safe return to earth. SpaceX integrated these technologies into the Falcon 9.

In April 2014, we completed the world's first soft water-landing, when, after successfully delivering its Dragon spacecraft to orbit, a Falcon 9 first stage touched down at near-zero velocity in the Atlantic Ocean. We conducted a second successful soft-landing in July 2014, further proving that a launch vehicle could withstand the forces of reentry and safely touch down. Our next step, ahead of returning a stage to land later this year, is softly landing on an autonomous spaceport droneship. Just last month, SpaceX soft-landed a Falcon 9 in the ocean with near-perfect precision and near-zero velocity.

The EELV Program, with its continually rising costs, has been trapped in what Lieutenant General Ellen Pawlikowski and Deputy Assistant Secretary Douglas Loverro coined the "vicious circle of space acquisition."[34] Essentially, the high costs of launch meant that the DOD could only afford a handful of launches, which forces the development of larger, more expensive satellites to minimize the number of launches. This not only leads to massive budget overruns, but also dramatically reduces technology refresh rates, because many of the DOD's systems take so long to develop that they are outdated by the time they reach orbit. Reusability will break this cycle, by dramatically lowering launch costs. It will mean that more funds can be spent on innovating and deploying new satellite systems, enhancing warfighter capability.

The cost of launch today represents a massive opportunity cost; with innovative new systems—self-funded by industry—the Government will be better equipped to deploy new satellites to meet the military's changing needs around the globe. Reusability enables true operationally responsive capability such that in the event of a conflict, DOD could rapidly replace damaged satellites and establish new capabilities, even in a hostile environment. This is, in other words, the essence of assured access to space.

X. Ensuring Fair and Level Competition in the EELV Program: Eliminate ULA Subsidies

[34] Pawlikowski, Ellen, Doug Loverro, and Tom Cristler. "Disruptive Challenges, New Opportunities, and New Strategies." Strategic Studies Quarterly Spring (2012): 27-54. Available at: http://www.au.af.mil/au/ssq/2012/spring/pawlikowski.pdf

Competition is coming to the EELV Program, but the contractual environment that exists today favors a sole-source incumbent. To ensure that competition occurs on a fair and level playing field, the acquisition and contracting environment must change in order to reflect competitive procurement approach.

SpaceX appreciates that the Air Force is taking steps to reintroduce competition into the EELV Program. As the Air Force restructures the program to on-ramp New Entrants for competition in the intermediate term, and contemplates the format for full and open competition beginning with the FY2018 Phase 2 acquisition, a number of key issues must be addressed to ensure a fair and level competition.

ULA receives, on average, $1 billion annually primarily on a cost-plus basis to fund “facility and facility support costs, launch and range operations, mission integration, mission unique development and integration, subcontract support engineering, factory engineering, etc.”[35] ULA receives these ELC subsidies whether they launch zero rockets or eight; if they launch more than eight times, they are paid additional subsidies. As was noted in DOD’s recertification of the EELV program after its 2012 “critical” Nunn-McCurdy breach, cost-plus contracting and the ELC has funded “effectively idle personnel” at ULA for years.[36] Essentially, the Government supports all of ULA’s fixed costs. Such funds are not provided to SpaceX, nor are they desired by SpaceX, and they are not contemplated to be offered to any other potential New Entrant.

ELC funding provides ULA with a major competitive advantage for national security missions, as well as civil and commercial missions. It distorts and conceals costs and pricing, as has been pointed out on multiple occasions by the GAO. ULA can marginally price launch services for commercial and civil customers because ELC funding allows ULA to maintain its operations and cover its fixed costs. Artificial reductions in launch vehicle core prices do not reflect true savings to the Government; they merely highlight that costs are shifted into the ELC. Ultimately, the taxpayer should not, under any rational circumstance, be funding 100 percent of the operational costs of any private company.

No competition will be fair, full, and open so long as the Air Force continues to utilize contract line items to fund ULA’s fixed costs to maintain its ELC. There are reasonable ways to address this competitive inequity now. At minimum, the fixed cost funding must be accounted for in a meaningful way in competitions for EELV launches and must be completely offset in non-EELV competitions. This near-term approach should be leveraged as the ELC is phased-out no later than 2018, prior to the Phase 2 EELV Acquisition to ensure fair and level competition. Congress should conduct continuous oversight to ensure the elimination of the ELC.

In 2015, the conditions that may have justified the ELC subsidy payments at one time have materially changed in virtually every respect. For example, the quantity of national security space launch has increased significantly, which eliminates the need for continuous launch capability funding support and enables a transition to a fully-burdened launch services price offered by each competitor. Also, the EELV Program is emerging from its reliance on a single provider with a limited ability to compete on the open market, and transitioning to a model with potentially multiple certified providers. With respect to the commercial market, the market is robust and stable through 2030; these forecasts are predicated on rational market assumptions and analysis, not hypothetical future systems. There is no remaining rationale for maintaining the ELC.

SpaceX recognizes that a transition away from the ELC will take significant planning and time. In the intervening period, however, as the Air Force on-ramps New Entrants and allows those certified to

[35] “Department of Defense Fiscal Year (FY) 2014 President's Budget Submission, Missile Procurement, Air Force.” Apr. 2013. Vol. 1, 230.
[36] Kendall, Frank. "Evolved Expendable Launch Vehicle Nunn-McCurdy Certification: Basis of Determination and Supporting Documentation." Memorandum to Congressional leadership. 12 Jul. 2012.

compete for missions identified to be ordered beginning in FY2015, the Air Force must require the incumbent provider to account for the derived financial and non-financial benefits it is afforded through the ELC payments it receives from the Government.

*****

Mr. Chairman, I appreciate your invitation to testify before the Committee today. SpaceX fully understands the national security requirement to have two fully capable, dissimilar launch vehicle systems in order to assure access to space. The most rapid and cost-effective way to achieve this capability is to expand competition, create proper incentives for industry to self-invest to meet customer requirements, eliminate American's reliance on Russian rocket engines as soon as possible, and end the practice of subsidizing launch services providers.