HEARING TO RECEIVE TESTIMONY ON

MILITARY SPACE LAUNCH AND

THE USE OF RUSSIAN-MADE ROCKET ENGINES

Wednesday, January 27, 2016

U.S. Senate

Committee on Armed Services

Washington, D.C.

The committee met, pursuant to notice, at 9:30 a.m. in Room SH-216, Hart Senate Office Building, Hon. John McCain, chairman of the committee, presiding.

Committee Members Present: Senators McCain [presiding], Sessions, Ayotte, Fischer, Cotton, Rounds, Ernst, Tillis, Sullivan, Lee, Reed, Manchin, Shaheen, Gillibrand, Blumenthal, Donnelly, Hirono, King, and Heinrich.

OPENING STATEMENT OF HON. JOHN McCAIN, U.S. SENATOR FROM ARIZONA

Chairman McCain: Good morning.

The committee meets today to receive testimony on military space launch and the use of Russian-made rocket engines from Under Secretary of Defense for Acquisition, Technology and Logistics Frank Kendall and Secretary of the Air Force Deborah James. We thank the witnesses for their service and for appearing before the committee.

With Russia and China aggressively weaponizing space, we can no longer take for granted the relative peace we have enjoyed in space for nearly 60 years. Both Russia and China are pursuing unprecedented counter-space programs and investing robust resources to challenge U.S. superiority in space. As Secretary James explained to "60 Minutes" last April, Russia and China are testing and investing in anti-satellite weapons, including direct assent missiles, ground-based lasers, and satellite jammers. To respond to these provocations, the Defense Department is investing $5 billion and reviewing nearly every facet of the way we operate in space and utilize our space-based capabilities.

In stark contrast to the reviews underway for satellites already in space, the Department appears less interested in rapidly addressing our most immediate threat, our reliance on Russian-made rocket engines. Today Russia

holds many of our most precious national security satellites at risk before they ever get off the ground. Yet the Department of Defense has actively sought to undermine, with the support of the United Launch Alliance, ULA, and the parochial motivations of Senator Shelby and Senator Durbin, the direction of this committee to limit that risk and end the use of the Russian-made RD-180 by the end of this decade.

My views on this matter are well known. The benefits to Vladimir Putin, his network of corruption, and the Russian military industrial complex are also well known. Yet despite the availability of alternatives, a select few still want to prolong our dependence on Russia while they target our satellites, occupy Crimea, destabilize Ukraine, bolster Assad in Syria, send weapons to Iran, and violate the 1987 Intermediate Range Nuclear Forces Treaty.

Our hearing today will closely evaluate the arguments of those making the same empty promises and proposing the same gradual transition that had been promised since the Department of Defense first allowed the use of Russian-made engines in 1995. Even then, Secretary of Defense Bill Perry recognized the inherent risks and made domestic production within 4 years a condition for using the RD-180. That was back in 1995. Yet 20 years later, after numerous stalling efforts rooted in corporate greed and naive assertions of

defense cooperation with Russia, little progress has been made in limiting the influence of Russia on space launch. This is unacceptable. I will do everything in my power to prohibit the use of Russian-made rocket engines in the future.

This committee has debated this issue at length. In hearings, in markup, and on the Senate floor, not once but twice. The fiscal year 2016 National Defense Authorization Act included compromise language that facilitates competition by allowing for nine Russian rocket engines to be used as the incumbent space launch provider transitions its launch vehicles to non-Russian propulsion systems. I certainly did not get the immediate prohibition I would have otherwise wanted, but was willing to compromise to send a unified message that the continued use of Russian technology to launch our satellites, not to mention the continued subsidy to Putin's military and close friends, was not in our national security interests.

At every turn, the Air Force and ULA have replied with stalling tactics, stale arguments, and suspect assertions. After years of reaping the benefits as a monopoly provider of space launch capabilities, ULA complains that eliminating the RD-180 will somehow result in replacing one monopoly for another. The fact is that ULA has two launch vehicles, and if the Air Force were to pursue split buys for a short

period of time until a new engine is developed, we could eliminate our dependence on the RD-180 today without compromising future competition.

The Air Force has also complained time and again that it cannot develop a new rocket engine by 2019. It says an awful lot about the current acquisition system when the default assertion from the Air Force is that it takes longer to develop a rocket engine today than it took to develop the entire Saturn V launch vehicle that took us to the moon in the 1960s.

It is unfortunate that it took the threat of today's hearing for the Air Force to award a contract for a prototype to replace the RD-180. 2 years after Russia invaded Crimea, the Pentagon just recently signaled its desire to allocate over $250 million for a prototype replacement engine. But even this welcome gesture appears fraught with non-compliance to congressional direction. Instead of picking two promising designs, the Air Force appears poised to dilute the limited resources across numerous concepts, some of which would require the development of an entirely new launch vehicle. In doing so, they will all but guarantee that no one will be able to develop an engine to replace the RD-180 by 2019.

ULA appears to be willing to take whatever steps necessary to extend its questionable dealings with Russia.

We saw this most recently when ULA took steps to manufacture a crisis by artificially diminishing the stockpile of engines they purchased prior to the Russian invasion of Crimea. That crisis proved short-lived. Just days after the signing of the omnibus appropriations bill, ULA announced it had ordered 20 new RD-180s, a nearly half a billion dollar windfall for Putin and the Russian military industrial complex with the added benefit of stringing out our dependence on Russian-made rocket engines. We must label ULA's behavior for the manipulative extortion that it is. And I look forward to hearing from our witnesses today whether they support the actions ULA took when they sought to coerce a change in the law by not competing for the GPS III launch late last year.

Tomorrow I will be introducing legislation with House Majority Leader Kevin McCarthy to strike language air-dropped into the 2,000-page omnibus bill last month. This legislation is the first of many actions I will take this year to ensure we end our dependence on Russian rocket engines and stop subsidizing Vladimir Putin and his gang of corrupt cronies.

I thank the witnesses again for appearing before the committee, and I look forward to their testimony.

And by the way, I did not mention the unprecedented and outrageous $800 million a year that ULA is paid for doing

nothing, an unusual and incredible expenditure of taxpayers' dollars, which fortunately we have cut off as a result of this year's defense authorization bill.

Senator Reed?

STATEMENT OF HON. JACK REED, U.S. SENATOR FROM RHODE ISLAND

Senator Reed: Thank you very much, Mr. Chairman, and let me thank you also for holding this hearing. It is a very important and vital subject.

I thank the witnesses for appearing and also for their service to the Nation in many different capacities.

I believe that today's hearing has three issues that the committee needs to understand and follow up.

First, what are we doing to develop a replacement for the Russian RD-180 engine? This committee has spoken forcefully, as the chairman pointed out, in two National Defense Authorization Acts to fund a replacement for it by 2019. The Congress has appropriated $444 million in the past 2 years in support of this effort, $304 million, indeed, that was above the sum requested by the Department of Defense. This is one of the rare events where the Department is getting substantially more funding than they are proposing. And I believe we are sending a strong message, and we want your response.

Second, I believe we need to understand what the Department actually needs in terms of RD-180 engines based upon what current Atlas V rocket can uniquely lift that other competitors cannot currently lift. We have been told that Atlas V will operate through 2022 until a new rocket

with a U.S. engine can replace it.

Third, I think we need to understand what the Department is doing to encourage the entrance of other competitors to the DOD launch market. The United Launch Alliance, or ULA, has to build an entirely new rocket. We should be encouraging other entrants as a hedge so that we avoid SpaceX being the only provider of launch, much like ULA was. In case there are delays with the replacement to this Atlas V rocket, we do not want to be in that position.

With that, let me thank everyone for their participation today, and I look forward to a very important hearing.

Thank you, Mr. Chairman.

Chairman McCain: Welcome, witnesses. Secretary James?

STATEMENT OF HON. DEBORAH LEE JAMES, SECRETARY OF THE AIR FORCE

Ms. James: Thank you, Chairman McCain, Senator Reed, and other members of the committee.

Frank Kendall and I welcome the opportunity to provide our perspectives today on space launch.

The U.S. relies upon space as an essential element of our national security. Space provides us with the ability to operate effectively around the world, to understand what our own forces are doing, and to stay ahead of our adversaries. Space is key to projecting credible and effective power around the world to support our allies and deter aggression. Maintaining our advantage requires the ability to modernize and replenish our space architecture through a reliable launch capability. And for this reason, maintaining assured access to space remains our number one priority. And indeed, this is memorialized in title 10 U.S. Code.

You may recall a string of launch failures in the late 1990s that resulted in the loss of billions of dollars of hardware and launches were suspended at that time for nearly 8 months while investigations were conducted. This experience reinforced the importance of having multiple pathways to space. Two highly reliable launch systems protect the Nation’s ability to access space, if one system

were to suffer a failure that grounded an entire fleet.

Assured access by law needs to be provided by U.S. commercial providers where space transportation services are required. Moreover, all of us -- all of us -- want competition between launch service providers because competition which, by the way, is also required by law, can help to control costs to the taxpayer and spur innovation in launch technology.

While we continue to believe that having access to about 18 RD-180s is prudent over the next few years to maintain competition in the short term, we also recognize very strongly the requirement in the fiscal year 2016 NDAA to transition away from the use of Russian engines through full and open competition. And I assure you we are working all of these mandates in law as quickly as possible.

Now, this is an exciting time to be in space launch. Whereas in the 1960s and 1970s, government investment largely drove technology development in this field, today private sources of funding have joined forces to spur a new generation of innovation in launch capabilities. And that is a great deal for the taxpayer because it means that not all of the funding for these endeavors has to come from us the way it did in the 1960s and 1970s.

We are optimistic about these new commercial entrants and have contributed our time, resources, energy, and

expertise to help develop their systems, understand needs, certify them for government applications, learn from their failures, and celebrate their successes.

For example, I recently spoke with Elon Musk to congratulate him on the achievement of returning a first-stage rocket to earth in a controlled manner, which is an event that may someday allow reuse of a major rocket component and reduce cost to the U.S. taxpayer, as well as other customers. So we look forward to continue working with U.S. companies to help mature these capabilities.

In the meantime, however, we must keep in mind the only launch vehicles that can reach the full range of orbits and carry our heaviest payloads today remain the Atlas and Delta families. ULA builds and flies the Atlas and Delta for the U.S. Government and other commercial customers, and they currently enjoy an unprecedented record of successful launches, 90 of which were accomplished under the EELV program.

Now, this achievement was enabled by very high levels of mission assurance, including rigorous engineering review and component testing. Funding for these government-mandated mission assurance requirements, along with the costs of maintaining launch infrastructure and a skilled workforce, came through a contract vehicle with the government known as the EELV Launch Capability Arrangement,

otherwise known as the ELC.

Now, while ULA operated in a sole-source environment, the ELC was an effective way to cover the government-mandated costs for the EELV, particularly the block buy. In a competitive environment, however, it is being phased out, just as the NDAA says, and it certainly will not be necessary in the future because we are moving into a world of competition.

In the interim, we have put in place an apples-to-apples cost adjustment situation for launch competitions to ensure fairness in those competitions.

Now, like some of you -- perhaps all of you -- I was very surprised and disappointed when ULA did not bid on a recent GPS competitive launch opportunity. And given the fact that there are taxpayer dollars involved with this ELC arrangement I just described to you, I have asked my legal team to review what could be done about this. And they are looking at options, including early termination of the ELC arrangement and how such an early termination could possibly impact the repricing of remaining block buy launches.

Another complication to consider is the state of play on the Delta, which is no longer commercially competitive. Given the restrictions on the use of Atlas, DOD must look for ways to meet the mandate of at least two commercially viable launch vehicles or family of launch vehicles capable

of launching national security payloads.

In a global launch environment, commercial viability is all about cost. But how do you incentivize industry to make the investments needed to spur the innovation that will bring down those costs? Well, we decided to ask industry that question directly, which is why we issued an RFI and obtained data to address that matter about a year and a half ago.

Now, after studying the responses to this RFI, we selected public-private partnership as the best way to ensure access to at least two domestic launch service providers. This business model, I want to say again, is a better deal for the taxpayer because it uses to a degree other people's money to help eliminate our dependency on the RD-180. And our fiscal year 2017 budget request will reflect this approach.

Now, let me give you an update on our plan and our progress to date.

Our plan includes first implementing robust risk reduction and technology maturation efforts. The science involved with rocket launch and getting into space is hard science, and technology maturation and risk reduction is a good first step for hard science problems.

The second step is we are using other transaction authority agreements to execute fast and flexible teaming

arrangements with industry partners for launch system development. And while we expected that some rocket propulsion system work might be required within these agreements, we never intended to focus solely on rocket engines. Unfortunately, the NDAA limits our effort in fiscal year 2016 to development of rocket engines. And of course, we are complying with this requirement. The Department, however, would strongly prefer not to fund a rocket engine alone because a rocket alone will not get us to space. We need an entire capability, not just one single component. If we were to continue down the path of funding rocket engines alone, we believe this effort would benefit only one -- only one -- launch service provider, which we do not really believe is anyone's intent.

In fiscal year 2017, we need and intend to apply our investment to ensure the availability of a complete launch system through public-private partnerships. And this in fact is step three of the plan.

Finally, in step four, we will award contracts for launch services projected to occur in the fiscal year 2022 and 2023 time frame. We believe this is the best approach to achieve our mandate of assured access to space with two certified commercially competitive domestic launch providers.

Implementing the fiscal year 2017 elements of this plan

will require the removal of language that restricts the use of these funds to engine development alone, and we would greatly appreciate this committee's support of this approach. So far, of the $260 million authorized and appropriated, which is $41 million that was reprogrammed in fiscal year 2014 and $220 million authorized and appropriated in fiscal year 2015, we have obligated just over $176 million, which is all of the 2014 money that was reprogrammed and $135 million of the fiscal year 2015 dollars. The balance will be obligated soon pending, of course, successful outcome on negotiations with industry. And all of these monies are directed toward the first two components of the plan that I just described to you.

To summarize, Mr. Chairman, we remain committed to assured access to space through at least two commercially viable domestic launch providers. We believe in competition. We think this is in the best interest of the taxpayer, and it ultimately will contribute to a healthy industrial base in the future over time.

We affirm we are moving as quickly as we can to eliminate the use of the RD-180 engine, consistent with the NDAA.

And finally, we remain committed to maintaining full compliance with sanctions against Russia. And yesterday I asked the Under Secretary for Policy and the General Counsel

of DOD to work with our colleagues in the Departments of State, Commerce, and Treasury to update a previous ruling on the matter of Energomosh, given that there have been recent changes over the last few weeks in the management of the Russian space sector. And we will get back to you on this soonest.

I thank you. I would yield to Mr. Kendall, and we look forward to your questions.

[The prepared statement of Ms. James and Mr. Kendall follows:]

STATEMENT OF HON. FRANK KENDALL, III, UNDER SECRETARY OF DEFENSE FOR ACQUISITION, TECHNOLOGY AND LOGISTICS

Mr. Kendall: Thank you, Mr. Chairman.

Chairman McCain, Ranking Member Reed, members of the committee, I am pleased to be here with Secretary James today to answer your questions about the Department of Defense's space launch program. Secretary James has already provided you with an overview of our priorities, some background, and our plans. I would like to use my opening statement to say more about the acquisition approach we would like to use to meet the Department's priorities of assured access to space, meaning at least two affordable and reliable sources of launch services for national security system launches, competition using commercial launch service providers to control cost, and ending the use of the RD-180 Russian engine for Department of Defense launches.

The first thing I would like to emphasize is that the Department does not buy rockets or engines. We do not buy launch systems or propulsion systems. What we do buy is the transportation of our satellites to space by launch service providers. Given our desire to eliminate usage of the Russian RD-180 engine, which is currently used on ULA's Atlas launch system when ULA provides launch services to the Department, the obvious and direct thing for the Department to do would seem to be pay for a new engine to replace the

RD-180. There are three problems with this.

First, engines and rockets are designed to work together. A copy of the RD-180 would be an Atlas engine, and it would not be of general use to the commercial launch service community. We would likely be helping one specific commercial launch service provider, as Secretary James said, with one specific launch system, the venerable Atlas.

Second, this would be expensive. Current estimates are that this would take about $3 billion.

Third, the Department does not need an engine, certainly not an Atlas engine. It does need assured access to space through reliable, affordable, and efficient launch service providers.

Second is the context in which we expect to acquire launch services over the next decade or longer. The commercial space launch business and space as an operational domain are both in transition. A number of commercial enterprises are planning large-scale constellations involving hundreds or even thousands of satellites. In this environment, the Department should be able to take advantage of the economies of scale associated with a large number of commercial launches each year. This potential market is motivating launch service companies like SpaceX, ULA, and others to invest in more modern and efficient space launch systems. The Department does not need to and should not

carry all the cost of developing more efficient space launch systems. We need to capitalize on these commercial investments.

Let me provide a word of caution, however. Some of us have seen this movie before. In the early 1990s, it was the promise of constellations like Teledesic, Iridium, and Global Star that led the Department to believe future launch costs would be much less than they turned out to be. We cannot be sure what will happen this time. But we do know that significant investments are being made in the planned commercial constellations, and we should do our best to take advantage of the opportunity that this environment presents.

From an operational perspective, Mr. Chairman, as you indicated, the Department is concerned about the ongoing foreign military acquisition of anti-satellite systems by countries like Russia and China. This development is causing a major rethinking of our space system designs with resiliency to possible attack now a much more important operational and technical consideration.

One approach that offers some promise is called disaggregation, with the replacement of current small numbers of highly capable satellites with large numbers of satellites that are more distributed capabilities. This development also suggests the need for more efficient launch service providers to field those constellations.

Given that we need launch services and not launch systems and given that we think the future commercial and military environments are both moving us toward the opportunity and the need for more efficient launch service providers, the answers seem clear. The Department has the opportunity to enter business arrangements with prospective launch service providers using a commercial model. The basic business deal we have in mind is that the Department will, through competition, provide at least two launch service providers with some of the capital they need to develop, test, and certify the launch systems they will use to provide us with launch services in the future, including any unique DOD requirements. In return for this investment, the Department will acquire the right to purchase launch services in the future at competitive prices and some degree of assurance that those systems will actually be available.

This commercial model is an innovative, out-of-the-box approach being taken by the Department. We sometimes refer to it as a public-private partnership. The exact form of these business arrangements will take will be very dependent on the unique needs of each competing prospective launch service provider. The Department has received industry responses to formal requests for information that Secretary James commented on which tell us that this concept has a real chance of success.

Our next step will be to release a draft request for proposals in the next few months. Contingent on the responses to the draft, we hope to have final RFPs on the street by the end of the year to support awards in fiscal year 2017.

In most acquisition strategies, the Department specifies the product or service that it desires and industry bids to provide the specified deliverables. In this case, industry will have an important role in defining the terms of the arrangement or contract. Each selected launch service provider is expected to offer unique terms that will have to be negotiated.

The competition will be conducted on a "best value" basis. The best value determination will take a number of factors into account. These plans are not complete, but the factors are likely to include the technical risk of completing the launch system and achieving certification, the schedule to provide launch services without Russian engines, the soundness of the business case to provide commercial launch services efficiently, the cost of any "not to exceed" future launch service options for DOD, and of course, the amount and timing of DOD funding needed to complete development and certification of the proposed launch system.

Secretary James and I would like to ask the committee

for its support in pursuing this novel commercial model. We believe it is very consistent with the direction to use more commercial acquisition models that the committee provided in the fiscal year 2016 NDAA. We are anxious to move forward so that we can end the use of the RD-180 and take advantage of the emerging commercial space launch service market. We will need your support for this approach in the 2017 NDAA by removing, as Secretary James said, the existing constraints that restrict our use of funds to only propulsion systems.

We would be happy to answer any questions that you may have.

Chairman McCain: Well, thank you very much.

Mr. Secretary, I certainly appreciate your and Secretary James' advocacy for competition here.

How much money are we paying, up until we prohibited it, to ULA just for staying in business? I guess it is called sustainable. Is that not about $800 million a year?

Ms. James: That is about right.

Chairman McCain: So we have been paying since -- what -- 2006 ULA $800 million a year to stay in business. It is kind of hard to compete if you are in the private sector when the Federal Government -- for doing nothing, when the Department of Defense pays you $800 million a year for a, quote, sustainable. And then when it comes to the launch, a GPS III launch competition, they do not compete. Is that

not a violation of the $800 million a year that we are paying them?

Mr. Kendall: Senator McCain, let me address what we --

Chairman McCain: Just tell me. Just answer the question. Should they be paid $800 million a year to be, quote, sustainable and they do not even compete on a launch? I would like an answer to the question. Should they have been paid $800 million a year?

Mr. Kendall: We agree with you that they should be bidding on our launches, and we are most disappointed --

Chairman McCain: I am asking the question, should they be paid $800 million a year for sustainable and not even bid on a launch? That is a pretty straightforward question, Mr. Secretary.

Mr. Kendall: Senator, we are all upset that they did not bid on the proposal --

Chairman McCain: What is the penalty? What is the penalty for that?

Mr. Kendall: As Secretary James indicated, we are looking into penalties.

Chairman McCain: Well, you are looking into it. I see. Since 2006 -- that is 9 years, $800 million a year -- that is astronomical, that sum of money of taxpayers' dollars, and after paying them $800 million a year for -- my calculation -- 9 or 10 years, then they do not even compete

on a launch. Is that the appropriate use of the taxpayers' dollars?

Ms. James: Senator, if I could jump in. You heard me in my opening statement say what worked in a sole-source environment will be anachronistic once we get off of the block buy and get beyond it.

Chairman McCain: How can you compete when your competition is being paid $800 million a year just to stay in business?

Mr. Kendall: Senator McCain, the ELC contract covers fixed and some variable costs associated with ULA's launch infrastructure. It was put in place to cover those costs to provide some stability.

Chairman McCain: Do you know of any other arrangement that we have with any defense contractor that pays them for doing nothing?

Mr. Kendall: Senator McCain, I cannot think of one off the top of my head.

Chairman McCain: Except staying in business?

Mr. Kendall: But I would like to explain how --

Chairman McCain: Do you know of any other? I would like you to answer the questions. Do you know of any other Federal arrangement with any other defense corporation where you pay them $800 million a year simply to remain in business? Do you know of another contract of that nature?

Mr. Kendall: I am not aware of another one similar to this.

Chairman McCain: Thank you.

I am sure you are probably not familiar with the names Igor Komarov or Sergey Chemezov or maybe even Dmitry Rogozin. Those all are three individuals that the United States has sanctioned, and all three of those have something in common. They are on the board of directors of the organization that we are now buying these rocket engines from. A Reuters' investigation showed that the Russian rocket engine manufacturer, Energomosh, and Pratt & Whitney Rocketdyne collects $93 million in cost markups. The article uncovers that in the past RD-Amross was investigated by the Defense Contract Management Agency which determined that in a previous contract that RD-Amross had collected $80 million in, quote, unallowable excessive pass-through charges. So we now have senior Russian politicians, friends of Vladimir Putin, in the management that are making tens of millions of dollars in the pass-through money that is paid for the Russian rocket engines.

Does that disturb you, Madam Secretary?

Ms. James: Yes.

Chairman McCain: You did not know anything about it?

Ms. James: You brought to my attention several of those names yesterday, and you heard the action I took as

follow-up yesterday, Senator.

Chairman McCain: You were never made aware of all this information before I brought it to your attention, even though it was public knowledge as far back as 2014?

Ms. James: The Russian names you gave me yesterday --

Chairman McCain: No. I am talking about the $93 million in markups that are just pass-through money.

Ms. James: What I am aware of is the Reuters article. I am also aware --

Chairman McCain: Were you aware of it? Were you aware of it?

Ms. James: Prior to the Reuters article?

Chairman McCain: The article was in 2014. Did you know about it in 2014?

Ms. James: I read the article in 2014.

Chairman McCain: And then what action did you take?

Ms. James: I inquired about it and learned that in the year 2011 there was a price reasonableness analysis done between Air Force and DCMA, which is the regulating authority --

Chairman McCain: That is 2011. In 2014, the Defense Contract Management Agency determined that in a previous contract they had collected $80 million in unallowable excessive pass-through charges. Were you aware of that, the Defense Contract Management Agency determination?

Ms. James: My understanding is that was fixed for this contract of the block buy.

Chairman McCain: It was fixed?

Ms. James: That is my understanding.

Chairman McCain: In other words, none of these individuals are now making money off of the sale of --

Ms. James: The block buy was price reasonable per the analysis is my understanding.

Chairman McCain: And Mr. Rogozin and Chemezov and Komarov are not making any money off of this?

Ms. James: I cannot talk to that. I have asked the appropriate authorities --

Chairman McCain: You should be able to talk to it. These people are people who have been sanctioned by the United States of America.

Ms. James: I am sure the appropriate authorities will get to the bottom of it.

Chairman McCain: We are giving them millions of dollars of American tax dollars.

Well, my time has expired but this is really, really, really remarkable, and we intend, frankly, to, in a totally bipartisan basis, try to fix this problem. But when some of us are surprised, when our taxpayers are angry, when the people who think that we are not working for them in Washington and see this kind of thing where we are paying a

company $800 million a year just to stay in business and then they do not even bid on a launch, you express concern when we are giving tens of millions of dollars to Russian corrupt oligarchs and taking no action to really resolve it and then, of course, work behind our backs, the authorizing committee, to try to nullify the action taken by this committee after hearings, after votes, after a debate, after talking about it on the floor of the Senate and you support the undermining of what we tried to do. Unacceptable.

Senator Reed?

Senator Reed: Thank you very much, Mr. Chairman.

Secretary James and Secretary Kendall, could you give your opinion on whether we could be in a situation by 2018 where we only have one launch provider? And what circumstances could lead to this? Because that would be a vulnerability that would be significant. Madam Secretary or Mr. Secretary?

Mr. Kendall: We have been concerned for some time that with the course that we are on, we may end up with one launch service provider. ULA has been competing, has done one competition with SpaceX. ULA is disadvantaged in that they have an older system and the costs associated with that system. They have to bid the systems that they have. SpaceX has a more modern system that they are providing.

We do make adjustments and we have corrected for a

shortfall in the ELC contract that Senator McCain asked about so that we have a fair playing field. Secretary James mentioned this in her opening testimony. So we are making adjustments that further disadvantage ULA because they will now essentially be paying a penalty for the fact that the contract that Senator McCain was talking about exists and some of their costs are covered by that contract.

So we are concerned that going forward they will not be very competitive. They recognize that and they know they need to get to a more efficient and affordable launch system, and they are trying to get on that path. Their viability and their ability to do that depends upon them having continued business over the next few years. That business comes in the form of Atlas and Delta launches. The Department stops using 180s, and it is questionable as to whether or not ULA will be able to remain in business using only Deltas.

We will not use Deltas as a preferred system because it is much more expensive than Atlas and it is much more expensive than SpaceX's system. So SpaceX would be the default almost automatically. They would be in an almost sole-source position at that point. And it is questionable whether or not ULA would survive. So we could very well be in a situation with only one launch service provider.

ULA has provided us with 80 or 90 successful launches

in a row. So that is a very important national capability. We have been able to rely on them very successfully. So we are not comfortable with being left with the risk of only being dependent upon SpaceX.

Senator Reed: Madam Secretary, your comments?

Ms. James: I really do not have anything to add. I think that was a good assessment.

Senator Reed: Secretary Kendall, just to reiterate, the point I think you made is that your conclusion is that we cannot rely just on a ULA Delta lift system and SpaceX. So the Atlas will be needed. Is that your conclusion? And what underlies that conclusion?

Mr. Kendall: Delta is a possibility as a second source. The problem is it is much more expensive than Atlas or the SpaceX's Falcon 9. It also has some issues in terms of production capacity. There would be a multiyear lead time to get Delta up to the rate that we would need to replace the Atlas launches. And there are some differences in terms of preparation time and so on that are not as significant. So Delta does not look to us like a good alternative to Atlas as a second source.

The intelligence community has asked that we look into that.

Senator Reed: Delta and the SpaceX would be using non-Russian engines.

Mr. Kendall: That would be all non-Russian engines. That is right.

The intelligence community uses mostly Delta launches. So they have been interested in doing more Deltas because that would lower their cost for their launches because of the economies associated with that. But for the Department of Defense, that does not look like the best business thing for us by a wide margin.

As Secretary James mentioned, we will take another look at this. We will take a deep look at it again. But I will be surprised if the answer comes out differently.

Senator Reed: The chairman has outline some very disturbing aspects of this program going back many, many years, and we cannot deny that. In fact, his efforts particularly have been trying to fix this program.

What I think you have suggested is the best path to a non-subsidized, competitive marketplace is this public-private partnership approach which you are talking about so that we will no longer have to put someone on retainer who may or may not participate given their bottom line decisions. Is that sort of an overall sense of where you would like to go?

Mr. Kendall: That is correct.

Senator Reed, if I could take a moment to talk about the ELC contract, I would like to explain what that contract

actually does, if I could do that.

Senator Reed: Yes. My time is limited, but within a minute if you can do that.

Mr. Kendall: It pays for costs associated with ULA's infrastructure, and it pays some variable costs associated with the launches. It was set up to provide a stable base for ULA to plan on and to have in place the capability to support about eight launches a year. And when we had only ULA as a source of launches, that was a very reasonable business thing to do. It allowed us to take some of the variation and uncertainty out of the market and to stabilize this. We have been successful with the ELC in bringing some of those costs down. Nothing was as successful as the block buy and the introduction of competition. And so that has been a very good motivator and we want to continue that.

But the ELC business deal was not a bad business deal. It is not a bad contract. And it is not a subsidy. The original contract included a provision for ULA obtaining commercial launches outside the Department of Defense. If it did so, we made an adjustment in the contract so that there would be no subsidy for those commercial launches. What we did not put in the original contract was a similar provision for DOD competitions because at the time we started out, we did not anticipate competitions. We only had ULA to buy launches from.

Now that SpaceX is competing, we realize had a problem there. SpaceX called that to our attention. They were correct.

So we have gone back and we have negotiated an agreement that changes the ELC contract so that there is no unfair advantage to ULA in a competition with SpaceX or another competitor for DOD launches. We have made a significant adjustment, and I mentioned it earlier. It further raises the effective cost of ULA's bids making them less competitive, which adds to our concern about their viability.

Senator Reed: Thank you. Thank you, Mr. Chairman. Thank you, Madam Secretary.

Chairman McCain: There are other competitors besides SpaceX, Blue Origin, and a number of others. So to somehow portray it as just between those two is, of course, totally inaccurate.

Senator Sessions?

Senator Sessions: Thank you.

Mr. Kendall, with regard to that point that Senator McCain made, are there other competitors, and what is the status of their ability to compete?

Mr. Kendall: There are people who would like to be competitors, but they are not competitors yet. Blue Origin that Senator McCain mentioned is in development. The launch

system providers all have modern systems in development to some degree. Orbital ATK is also considering a new system.

So what we would like to do through the public-private partnerships that I mentioned is get business deals with at least two of these potential future suppliers so that we have modern systems after we get off of the RD-180 to replace it. Right now, the only certified launch providers are SpaceX and ULA.

Senator Sessions: Well, first, this committee has been unanimous and I have been firmly committed to getting off the RD-180 as soon as possible. I will acknowledge that I have been critical of the length of time, but as I have learned more about it, I realize you have a more complicated situation than most of us fully understand.

So in the interim, you have asked the committee last year for 14 RD-180s to be provided, and the committee, after much discussion in the subcommittee, was acceptable to your number. But we ended up with nine. Senator McCain suggested nine, and that is the decision of our committee. And then the Appropriations Committee basically said to the Defense Department we will not put a cap on it. You decide how many RD-180s will be purchased. So that has caused a disturbance, let us say.

Secretary James, you mentioned 18 now. You think it may be more than 14. And why do you need 18? Is this some

sort of interim supply while this bid process goes forward? What is the reason you might need more than 14?

Ms. James: If I may clarify, Senator. If you remember, there were five engines originally available, if you recall. And last year what we said was we said a total -- this included the five -- of about 18. You are saying 19. My recollection it was 18.

Senator Sessions: 18.

Ms. James: On the order of about 18 to us seemed reasonable to get us over the hump and allow for competition as we transitioned to a full-up competitive environment away from the Russian-built engine. So 18 seemed to be a reasonable number to deal with to get over that hump. There were 34 competitions during this interim period, and to have 18 engines against 34 competitions seemed to us to be reasonable. So I was simply restating that that was and remains our position, a prudent, reasonable way forward. That is what I was meaning to say.

Senator Sessions: Now, the committee, as has been noted, authorized $220 million. You referred to that, and there is some more money left over from previous appropriations to fund this transition. What is taking so long, and what can Congress do? You have suggested there are some problems with the mandates we have placed on you. What are those problems? So do we have enough money? Are

we on track to have more than one competitor?

And you would expect, Mr. Kendall, that any competition would be cheaper than the RD-180 ULA current system? If they are not cheaper, they are not going to win the proposal. Is that right? Where are we in this process and what is going to happen?

Mr. Kendall: I would agree with that last statement, Senator Sessions.

Senator Sessions: The last statement was that transitioning from the ULA system to the new system that SpaceX is competing for and others could compete for you would expect a cheaper launch system.

Mr. Kendall: I expect a modernized system by any competitor to be cheaper, and it would not make any sense for us to --

Senator Sessions: It would be fully American.

Mr. Kendall: Yes, absolutely.

The problem we have right now is that the current NDAA restricts us to work on propulsion systems, rocket engines. As I mentioned in my statement and Secretary James mentioned, that is not what we need. We need launch service providers with full launch systems that can take us into space. And we want to get business deals that get us to that goal and that give us some assurance of reasonable prices for future launches. So that is where we need to go,

and we need the constraint that we currently have removed so that we can do that effectively and efficiently.

We have been trying to comply with the law, and we have complied with the law throughout this. And we have tried to find a way to move forward by investing in propulsion systems. That is what the contracts that Secretary James talked about do for us. But they are propulsion systems and we think they are linked to possible future launch systems, but what we really want is the commitment to get us that full future capability and we cannot do that with the constraint that we have right now.

Senator Sessions: Have you submitted a proposed legislative change that we can consider?

Mr. Kendall: I do not think we have, but we would be happy to do that.

Senator Sessions: And the reasons why would be appropriate I think. Thank you.

Mr. Kendall: Yes, sir.

Chairman McCain: Let me just point out that it is not rocket engine. It is rocket engines that we are buying from the Russians, not anything else. That is why we are focusing our attention on Russians making hundreds of millions of dollars. And so we are not restricting anything except that we want to get rid of our dependency on Russian rocket engines. So for you to keep saying that we are

making restrictions on it, we are not. We are not restricting SpaceX. We are not restricting Blue Origin. We are not restricting anybody that wants to get into the game. What we want to do is get out of the Russian rocket engine business and stop subsidizing one military industrial complex for $800 million a year of the taxpayers' money for nothing, and then they turn around and refuse to bid after we have given them $800 million to stay in business.

Senator Heinrich?

Senator Heinrich: Secretary James and Under Secretary Kendall, welcome.

I remain supportive of efforts to end our Nation's reliance on the Russian-built RD-180 rocket engine, recognizing, as you said, that we need a complete launch capability.

Since the 2014 Russian invasion of Crimea, I have certainly supported our Nation's ongoing investment to develop a new engine to replace that RD-180 as important to accomplish that goal. Over the last 3 years, we have appropriated $403 million I believe to accomplish that goal. And Congress has been pretty clear and bipartisan in its desire to pursue a replacement engine and to do that quickly.

I think what you are hearing here is a frustration in the speed at which we have been able to accomplish that and

what appears from the outside as well as sort of a salami slice approach to all of this.

So I want to ask what work specifically is being done in these other contracts. Is this work specifically tied to developing a replacement engine for the RD-180, or are other efforts being funded with this money that will not necessarily get us to that launch capability?

Ms. James: I will start and then maybe Mr. Kendall can jump in.

The $400 million and some that you referenced, Senator, includes $227 million I believe, if memory serves me, which was the fiscal year 2016 authorization/appropriation, which has been available to us for roughly 5 to 6 weeks. It only just became law in December. So the figures that I gave you were our efforts to obligate as quickly as possible the 2014 and 2015 money. And as I was attempting to portray, the vast majority of that now has been obligated, and we expect the balance to be obligated quite soon pending successful negotiations with industry. I do want to underscore that. It takes two to tango, and we can have all the urgency in the world, but we cannot give away the farm if the negotiation does not go well because the farm belongs to the U.S. taxpayers. So we are trying to have that balance between speed but getting a good deal for the taxpayer.

You mentioned spreading the money around or salami

slicing, words to that effect. The first part of this plan that I laid out for you has to do with what we call technology maturation and risk reduction. And this is a typical approach when you are dealing with something new and difficult. And believe me, this is hard science. I have talked to enough of the technologists to believe that this is not as easy as it sounds. And so for something that difficult, something where the U.S. Government has not invested hugely in the past few decades, it is a prudent approach to try to reduce the risk and then share those learnings across industry so that it helps others in the future. So that is why this money is being sent to different locations in a full and open way, by the way, because I do want to emphasize that.

Senator Heinrich: I recognize that. But are you worried that by sort of spreading this across multiple pathways that you actually push back the timeline to ending our reliance on this core capability, which is the RD-180?

Mr. Kendall: I think the confusion is about what we are trying to do and how we are trying to do it and how the contracts we have let get us down that path.

As I mentioned in my opening comments, one of the paths we could have taken was to simply buy an RD-180 replacement, buy a look-alike clone, if you will, of the RD-180. If we had done that or if we did do that, we would be buying ULA a

new engine for Atlas, which would be perfectly fine for ULA, but it would not get us off of Atlas. It would not get us a modern, efficient, affordable launch system as a viable competitor to others like SpaceX.

So what we did, given the restriction in the law -- and the restriction came from the House side of the House Armed Services Committee in their bill. It basically said we cannot use the funds we are appropriated to develop or procure a new launch vehicle or related infrastructure. We were restricted to development of propulsion systems.

So what we have done is look at the propulsion systems and evaluate them for ones that have a reasonable chance of being in a future launch system. And propulsion is not just about the first stage, which is what the RD-180 is. It is about the upper stages and other things.

Senator Heinrich: I understand.

Mr. Kendall: So the two contracts we have awarded -- one of them is for some upper stage work; the other is for solid rocket motor work. We are going to award two more, which will cover -- I cannot talk about the details of those yet because they are not awarded.

So each of these is intended to move us down the path and reduce some of the technical risk associated with getting a new launch system that is much more efficient and affordable and modern. But it does not accomplish that goal

by itself. It is a step in the right direction.

We would like to move much more quickly and directly to the goal that we have in mind. And that is where we are asking the committee's support to allow us to do.

Senator Heinrich: Thank you both. Obviously, my time has expired.

I hope at some point you can get to the heart as well of dealing with whether the sustainment as a contract exercise is paying ULA to effectively do nothing. But my time has expired and I will give back my time, Chairman.

Chairman McCain: Senator Cotton?

Senator Cotton: Secretary James, do you believe that Russia is an enemy of the United States?

Ms. James: I have said publicly before and I will say again, sir, that I think Russia is the top threat to the U.S.

Senator Cotton: So you agree with the testimony of General Dunford and several other members of the Joint Chiefs that Russia is our number one threat geopolitically in the world?

Ms. James: Yes.

Senator Cotton: Has the United States ever had assured access to space?

Ms. James: That is our top job is to make sure we have assured access to space.

Senator Cotton: But under the current understanding, have we had assured access to space?

Ms. James: Yes.

Senator Cotton: We have. Okay.

Could we end our reliance on these Russian-made rockets today and still maintain assured access to space by relying on Falcon 9 and Delta IV?

Ms. James: I would say it is theoretically possible, but the devil would be very much in the details.

Senator Cotton: So both of those rockets are certified. They can carry all kinds of lift, heavy, intermediate, and so forth. Why is that only theoretically possible?

Ms. James: There is a current manifest based on warfighter needs and the intelligence community needs, and that manifest, to a certain degree, depends on a mixture of engines. If you were to suddenly swing and take one type of engine away and say hereforth it must be only this sort of engine, that would require probably delays in launches. I am thinking certainly it would be a lot more money because Delta is a much more expensive proposition. It would have to be reworked. There would be a lot of details to work through.

Senator Cotton: What kind of gap would you fear if that were the case?

Ms. James: Without doing an analysis, detailed, I would be totally guessing. I would guess years, but that is a guess.

Senator Cotton: And what is the current status of the possibility of replacing the RD-180 with an American-made rocket engine, say the AR-1 or the BE-4?

Ms. James: We are marching toward 2019. That is the way all of our urgency is directed. And industry tells us and we certainly think it is possible, though it is going to be challenging to make 2019 for an engine. But I must say an engine alone will not get us to space. It needs to be integrated with a rocket. It needs to be tested. It needs to be certified. And to get all of that done, to have a launch capability, will be longer than 2019.

Senator Cotton: Which theoretically we could do now though with the Falcon 9 and the Delta IV, since they are certified.

Ms. James: I say theoretically but it would require looking into all of those details.

Senator Cotton: I am struggling with why you cannot maintain the promise of future competition if you just pursue a split buy for a few years of the 9 and the IV until this new engine is developed, if it is a top priority not to rely on these Russian-made rocket engines. Secretary Kendall, you look like you want to --

Mr. Kendall: There are several problems with that. One is, obviously, the cost of Delta. It is tens of millions of dollars more than Atlas or Falcon 9.

Senator Cotton: But we have paid $800 million for no activity.

Mr. Kendall: We paid $800 million toward specific costs associated with getting the infrastructure that ULA has for launching both Atlas and Delta. That cost is associated with the capacity to launch eight launches per year. Those costs have been reviewed many times. They are reasonable costs for us to bear. It is not nothing, as the chairman indicated. I am sorry about that.

The difficulties with Delta are its effect -- the loss of Atlas' effect on ULA's viability; the cost of Delta, tens of millions of dollars more; the amount of time it would take us to ramp up production of Delta, which would be on the order of 3 years; and then some other minor issues that we could probably work our way around if we had to. So it is not impossible. It is just very difficult.

Ms. James: Could I also add? Delta is the one that is not commercially competitive. So if we were to swing in that direction, we would be the sole customer I believe. And the price -- again, likely, but we would have to examine the details -- would go up even more than the differential today between Delta and Atlas because this ELC arrangement

you have been hearing so much about -- those costs I can pretty well guarantee you would somehow be calculated into the new price of Delta. Whether you call it an ELC arrangement or whether you call it something different, I believe the U.S. taxpayer would bear those costs.

Senator Cotton: My time is concluding. I will say that in a program that spends billions of dollars over the years, tens of millions of dollars of costs to develop an American-made capability so we are not depending on our number geopolitical adversary's industrial base seems to me a reasonable cost to bear, in particular when their industrial base is going to be able to use those profits in part to develop their counter-space capabilities. And we are going to be putting into our rockets parts that are made in Russia that for all we know might be corrupted or have some kind of cyber threat to them. So I would opine that we might want to consider bearing those costs to develop domestic capabilities as quickly as we can to include the two rockets that are currently certified.

Chairman McCain: Senator Hirono?

Senator Hirono: Thank you, Mr. Chairman.

I believe this committee has made clear that we do not want to continue to rely on these Russian-made engines.

Secretary James, I am interested in the portion of your testimony wherein you say -- and both of you have testified

to this -- at this time you are constrained by statute to work only on space propulsion engines. So I know that one of my colleagues had already asked this question, Senator Sessions. But I would really like to see where in the NDAA you find this constraining language. First I would like to have that identified, and then I would like a proposal. We would like to see a proposal for additional language so that we can assure ourselves the access to space that is our goal. You may not have that language right now, but I certainly would be interested in those two areas that I asked about.

Mr. Kendall: Senator, if I may. The section is section 1606 of the fiscal year 2016 NDAA. And we do not have language for you today, but we would be happy to provide that.

Senator Hirono: The reason I am pursuing this is because there seems to be a dispute as to whether or not we do have constraining language on the Department.

I would like to turn to small satellites and operationally responsive space, ORS. I am a supporter of the ORS office, especially in the area of developing smaller, cheaper systems, which can be launched more fast than conventional systems. And I know that our more complex and larger systems will be needed for many payloads, but where the smaller and less complex systems can be used, we

should do so.

I know that you are investing in this. This is for Secretary James. But I also believe strongly in research and development for these systems. Can you share your thoughts on ORS and what you would like to see in the future and talk about the R&D side and the involvement of industry, universities, and labs as we develop these faster, smaller, and cheaper launch systems?

Ms. James: So, Senator, I am a believer in ORS as well. I mean, there was a period where this was not being funded, and we are funding this going forward. So I certainly am a believer. And when it comes to small satellites, this is of great interest to the Department. It is a trend, I will say, in the commercial arena. You have talked about universities and industry. We are in constant discussions with those who are attempting to excel so that we can learn from them and partner wherever possible.

The other thing I will say about small satellites is it does hold promise for us in certain arenas for greater resiliency. So it is like you do not put all your eggs in one basket. You spread it out, so to speak. So it could help us in our resiliency quest, and also they tend to be a whole lot less expensive. So for all of these reasons, it is of great interest.

Now, with all that said, we have to make sure that when

we launch something, that it is going to fit within our architecture and that we do some proper technology demonstrations and experiments in advance. And, indeed, this is where ORS can come into play in a bigger way.

You may recall ORS is working on a couple of things right now. They are working on a follow-on for the SBSS, space-based space surveillance, program. And they are also doing technology demonstration -- or they are about to -- with respect to the weather.

So a big believer in ORS and very interested in small satellites to help us in the future.

Senator Hirono: Secretary Kendall, would you like to add anything to that?

Mr. Kendall: No. I think Secretary James covered it very well.

One comment I would make is that as we move into an era where desegregated constellations are possible and we would be living in an environment in space with some massive commercial constellations in low earth orbit, that as we deal with the threats that Senator McCain mentioned, the attractiveness of an ORS type of an approach becomes much more so.

Senator Hirono: Are we putting enough resources into this part of our access to space goal in terms of money for R&D?

Ms. James: I believe we have it about right.

Senator Hirono: What is it?

Ms. James: Well, the details, of course, we will roll out shortly as part of our fiscal year 2017 budget and the accompanying 5-year plan. But you will see that we have funded ORS throughout.

Senator Hirono: I am going to have continuing interest in that, especially as I also serve on the Intelligence Committee.

Secretary Kendall, there has been a discussion within Congress on the idea of giving more responsibility in the acquisition process to the service chiefs. I would be interested in what you think would be the benefits and the drawbacks of moving in that direction.

Mr. Kendall: Thank you. I am a little disappointed, Mr. Chairman, that the hearing yesterday was canceled when the chiefs were going to come over. I read all their testimony, and I have no issues with what they were going to say.

We have always supported that provision in the fiscal year 2016 NDAA. Having the chiefs more engaged in requirements tradeoffs and assessments of programs and actively engaged I think is very beneficial to the Department and to the services.

I have already met with each of the service chiefs,

talked about the bill and how it affects them, and they are all off charging it -- you know, how they would operate under that guidance.

It is a work in progress.

The only risk I see with it is that the chiefs are generally not experts in acquisition. They are experts in operational matters and requirements of leadership and so on. And their tendency is generally to try to go faster and get more and get it for less. We have gotten into a lot of trouble by making assumptions about how fast we could go and how much things would cost and how much they would do that prove out to be false.

One of the reasons my position exists is to provide a check and balance to that tendency. So I would still think that such a check and balance is needed, but the law does not remove that capability. So I am supportive of that provision and looking forward to working with the chiefs in their new role.

Senator Hirono: Thank you very much.

Thank you, Mr. Chairman.

Chairman McCain: Senator Ernst?

Senator Ernst: Thank you, Mr. Chair.

Thank you to Secretary James and Secretary Kendall for being here as well.

I think you have heard today we are all just very

disappointed in the way the process has gone so far. We have an opportunity now to move forward in a different direction. So I am not going to hammer so much that, but the fact that I am assuming for decades the Air Force has known that the RD-180 could be withheld by the Russians at some point. So why is the solution just now being addressed? I would have thought this is something that should have been part of our discussion years and years and years ago. Can somebody explain that to me?

Mr. Kendall: It actually has been part of our discussion. I think this predates Secretary James' return to the Department.

We have looked at budget issues to remove the dependency on the RD-180, but in the funding climate we have been in for the last several years, it has been unaffordable to the Department.

Now, when the Crimean events occurred, that all changed and it became obvious that we could no longer accept the risk of continued reliance on the RD-180. So I think we are all in agreement now that we need to get off of it as quickly as possible.

Prior to that point in time, we had consciously considered investing money to remove the RD-180 and develop a U.S. alternative, but it did not make the budget cuts, frankly, given the funding situation that we had.

Senator Ernst: Was that an issue of Congress or was that a departmental decision?

Mr. Kendall: That was within the Department.

Senator Ernst: Should the Air Force have started a replacement engine program then long ago before it became so critical? Was that not a discussion that should have come to Congress?

Mr. Kendall: With hindsight, we obviously should have. The expectation was that relationships with Russia after the end of the Cold War were going to be relatively benign. That has not turned out to be the case.

Senator Ernst: And just so we do not repeat this error in judgment -- and I think we need to look at many of our acquisition programs and the way we do business across the board, not just this particular propulsion system, but we need to take some lessons learned here and move forward. But who in DOD, if anyone, should have been responsible for conducting the long-term planning and architectural development for the national security space enterprise including launch? Is there one person? Who is that? How is that structured?

Ms. James: Well, I would say today if there is a single person, it would be me. And I am, in addition to be Secretary of the Air Force, the principal defense space advisor. So that means my job is to, in a joint fashion,

look not only at the Air Force but look at the entirety of our budgets because, of course, there is Army space, there is some Navy space as well to be able to work across the requirements community. I do not do all of this by myself. I do not mean to suggest that, but to be a single point of contact who can then make independent advice to the Secretary and Deputy Secretary.

But again, that is a new development. If you are going back in time, there probably were too many voices and no single independent voice that could reach across and provide that advice.

Senator Ernst: And are there communications now then between yourself and the other service branches?

Ms. James: Yes, there are. I chair what is called the Defense Space Council. I am the principal advisor now to the Deputy and Secretary in terms of what we call the DMAG, which is where all of the important money discussions occur, as we are building our POM and finalizing our budget and so on. So there are additional authorities of late.

Senator Ernst: And can you describe that process then to me, because I am not familiar with that, how you do interact with the other services? And is this something we need to be aware of, any types of these situations that might happen with funding in the other branches as well?

Ms. James: There certainly always crop up issues of

policy and issues of funding across the Department of Defense. But my role now as the principal defense space advisor is to stay well coordinated with the others, and even though at times I might be asked to go against my own Air Force budget, that is my job. That is my role to be able to rise above that and act in a joint way and be that independent voice.

Senator Ernst: Well, my time is running short, but I think communication is very key here. And when these things do crop up, it is important that we engage Congress as well. We cannot let this happen again. You have spoken many times over about the American taxpayer. They expect much better from us. We have to do better. So lessons learned. We need to move forward at this point, and I think we need to develop our own technology as quickly as possible.

But I thank you both for your time.

Thank you, Mr. Chairman.

Chairman McCain: Senator Tillis?

Senator Tillis: Thank you, Mr. Chair. And sorry about your Cardinals.

Chairman McCain: Thanks for bringing that up.

[Laughter.]

Senator Tillis: You know, first I share the frustration with the chair and the others that have spoken today. You know, it is amazing to me that creating this

consistent capability since the time that we have started to where we are today has taken more time than the time between President Kennedy's aspiration to go the moon and getting to the moon.

My question, though, relates to something -- and I am sorry. I have got a concurrent Judiciary Committee hearing going. But it relates to the supply chain and the missions that we currently have planned either within DOD or outside of DOD. And if we put all of our emphasis on a domestic launch capability, what sort of risk do we have in terms of important payloads where we are already in the chute to get them put into space? So what sort of risk do we have? And particularly I know some of the DOD missions you cannot talk about. But I am just trying to get some sense of what are we looking at as a real shift to the right of many things that we want to get up into space sooner rather than later.

Ms. James: The shifts to the right or the possible delays -- I think I raised that as a detail that we would really have to think through carefully if we were to make the decision to stop all RD-180s and shift to have Delta on the one hand and the SpaceX on the other hand.

Senator Tillis: I think as you go through that process, you should also look into the cost of delay because there is some inherent cost in having to carry those over and everything else that ripples through. I just think it

is an important part of the decision-making process, while the real emphasis needs to be on getting that domestic capability. But that is information we need sooner rather than later.

I know I have asked for some of it back when we were doing the NDAA. So I am hopeful that we can get that pretty quickly.

And, Mr. Chair, because I was out for most of the committee, I am not going to take any more time, but I did want to ask that question about getting the optics on the supply chain to us fairly quickly.

Chairman McCain: Sorry you made it back.

[Laughter.]

Senator Tillis: Go Panthers.

Chairman McCain: Senator Rounds?

Senator Rounds: Thank you, Mr. Chairman.

Let me just walk my way back through this program to make sure that the background that we are all working with is consistent.

The intent originally, as I understand it, was that there was always going to be at least two organizations providing the delivery of our products into space. Originally we had two separate companies who then in 2006 joined together to create ULA. ULA then had two products, one from each of the two companies who they were at that

time supporting, one being the Atlas V and also then the Delta IV, the Atlas V capable of intermediate lift capabilities, the Delta IV, the more expensive product, also capable of heavier lift capabilities.

Am I so far correct?

Ms. James: Yes.

Senator Rounds: At the present time, you have then one organization now providing both of these products, but do both of these products not use commingling of parts in terms of their second stages? Even though we have got the RD-180 rocket under the Atlas, which is the Russian rocket motor, the Delta IV, being more expensive but also having more capabilities, both of them using the same products for their second stages and so forth. Is that correct? My understanding is that they are using the same product in both of those, or am I mistaken?

Mr. Kendall: That is quite possible, but I do not know for certain if it is.

Senator Rounds: The reason why I ask is because I think we have always wanted the capability to have separate and independent supply lines, but if my suggestion is correct, we have had a single-source point for both of these two vehicles in other parts of the payload delivery systems.

Mr. Kendall: Sir, I have not looked at that. That is something we could take a look at. I think if there are

parts that are dual use, they are generally low-risk parts where we do not expect failures to occur, and they are parts that an instruction to an individual company could be replicated relatively easy. But I am not certain of that. I need to go check.

Senator Rounds: Could you get back with us in terms of the second stage and so forth? The remaining part of this delivery product, as I understand it, has --

Mr. Kendall: I understand. If there is a problem there, I am not aware of it. But we would have to check.

[The information referred to follows:]

[COMMITTEE INSERT]

Senator Rounds: Okay.

Second question. I think Senator Cotton was on target when he started discussing about the fact that we wanted the assured access to space and at this time we believe that we have it. But at the same time, we are talking about only intermediate delivery weights. If we are talking about heavy delivery weights, today we have only got one system out there and that is the Delta IV. Is that not correct?

So then how do we say that we have the assured access to space with regard to our heavier payloads?

Mr. Kendall: The short answer is we do not. We would like to have that, but it has been prohibitively expensive. If SpaceX develops their heavy vehicle --

Senator Rounds: Excuse me. It would be consistent to say that we have the capability for intermediate payloads, but we do not for the heavier payloads at this time.

Mr. Kendall: That is correct. And one of the things we would like to be able to correct is that shortfall with future launch systems.

Senator Rounds: Well, but my understanding also is that the Delta IV, which is the product which ULA is currently proposing to phase out, is the only delivery system currently available for the heavier payloads. Is that not correct?

Mr. Kendall: I believe that ULA is phasing out one

variant of the Delta, and I do not believe it would preclude our launch. Is that correct?

Ms. James: Correct.

Senator Rounds: Verify for me please. The Delta IV is --

Mr. Kendall: Each of these rockets has different variants, and one of the variants of the Delta is being discontinued. ULA has announced they want to do that, but not all of them. I think it has not put our launches at risk.

Senator Rounds: So you will still have heavier lift capabilities.

Mr. Kendall: Yes, I believe so.

Senator Rounds: Could you confirm that for the committee, please?

Mr. Kendall: We will double check that, but I believe we would be all right.

Senator Rounds: Okay.

Another question on this. It seems to me that we now have two companies who at one time were competing with one another. They joined together in 2006. They have been since that time competing with two separate products but both of them they are responsible for. And during this time, we have assumed that that provided us the assured access to space.

Now, we have got these two organizations together, ULA. We have been providing them with a base. And I understand the concern the chairman has about $800 million a year, but I also understand that you want a consistent capability that is there and available on short notice.

My question to you, though, is this. This organization, while they have been buying product from Russia -- and it appears that under our contracting program, we really did not care. We were looking the other way while they were using Russian rocket motors, the RD-180, during this time period because it was less expensive for us even though even back in the 1990s, there was a clear direction that if we ever used anything from the former Soviet Union, Defense Department policy clearly stated that it had to be phased out in 4 years. But we appeared to just look the other way during this entire time frame?

Mr. Kendall: You are correct about all that. "Look the other way" would probably be not the way I would characterize it.

Senator Rounds: You looked at it and just ignored it?

Mr. Kendall: No. The way I would characterize is we accepted the risk associated with continuing to use the RD-180. As I said in response to Senator Ernst's question, there were conscious considerations of this situation in the Department. We were well aware of it, and we knew there was

an element of risk associated with it. It was a multibillion dollar bill to build a clone of the RD-180 in the United States. In the tight budget environments we were in, that did not make the cut in the Department of Defense. It was consciously considered. With hindsight, obviously, we would like to have done something different, but we did not. So here we are.

Senator Rounds: Thank you, Mr. Chairman.

Chairman McCain: Senator King?

Senator King: I apologize for missing some of the questions.

One of the pieces of analysis is the value to the taxpayers of a competitive launch versus using the Delta, which seems to be more expensive, if there is a lack of the 180s. Mr. Kendall, have you quantified that? What would the additional cost be?

Mr. Kendall: Senator King, you put your finger on the question here. It is really a policy question of how much additional taxpayer money we should spend and how much risk we should take in the context of denying some income to the Russia oligarchs we have been talking about. That cost is on the order of tens of millions of dollars at least, and it depends upon how many launches and how much over a period of time. It also is a cost in delay, and it is a cost in risk in the viability of ULA if we go down that route. So there

are a number of things there that weigh against moving in that direction.

But there are things that weigh for it. Senator McCain is very eloquent about that. It is a policy decision. At the end of the day, the Department of Defense will do whatever the law directs us to do. If we are directed to get off the RD-180 today, we will do that, and we will do the best that we can without it. But there are costs associated with that.

Senator King: But I would hope for the record you could perhaps give us some more detailed analysis. Is it tens of millions, hundreds of millions? Because that has to weigh into our decision.

Mr. Kendall: It is at least tens of millions. Depending on how many launches were affected, how long it takes us to get to a more efficient source, it could be hundreds of millions, and it is delays that are measured probably in years. We could try to give you some more definitive information on that, though, if you would like. We will take that for the record.

[The information referred to follows:]

[COMMITTEE INSERT]

Senator King: I would appreciate that.

And the second question is similar. As I understand it, there are a number of 180s in the pipeline that are approved under various discussions, but if we cut it off at different points, 9, 12, 14, 20, whatever, there could be a competitive gap. In other words, there could be a period of years where there is no alternative. Is that accurate? And if so, what is that period? When does it start? When does it end?

Mr. Kendall: We believe it would be several years before we could have a certified replacement for the RD-180. Our best estimates are that 2021 or so would be the time we could have a replacement. We would like to go faster. And if we look at public-private partnerships, we would hope that some of those could go faster in terms of giving us a replacement. But that is our best estimate right now.

Senator King: And just because I am not sure what magnitude of dollars we are talking about, what does one of these rocket engines cost?

Mr. Kendall: A medium launch is on the order of $100 million a launch. It is a good figure just to keep in your head.

Senator King: That is the cost of the launch.

Mr. Kendall: Yes.

Senator King: But I am talking about ULA. When they

buy the rocket engine from Russia, what does it cost?

Mr. Kendall: I believe the engine cost is on the order of -- I am going to look to the people behind me. I think it is about $20 million. $30 million.

Senator King: So $30 million is what we are talking about going to Russia. Of course, some significant part of that is the physical cost of building it. We do not know how much profit Brother Putin is making on those.

I really appreciate the analysis and look forward to that detailed analysis of the cost differential because I think that is an important consideration for us. Thank you very much for your testimony.

Thank you, Mr. Chairman.

Mr. Kendall: Yes, sir. Thank you.

Chairman McCain: I would like to point out to my colleague that both Blue Origin and SpaceX are developing and have had partial success with a reusable rocket engine. So that, of course, has a huge effect. And there has been at least one success. So to somehow assume that it is going to be tens or hundreds of millions of dollars in extra costs ignores what these other non-ULA organizations are doing.

I am thinking now that we will have these various organizations that are not being subsidized for $800 million a year up before the committee. And I will tell you in information they have conveyed to us, reusable rocket

engines are certainly something they have had some success with. That changes the equation dramatically.

Senator King: It changes it completely. I fully agree. Thank you.

Chairman McCain: Senator Lee?

Senator Lee: Thank you, Mr. Chairman, for holding this hearing and for your attention to this important issue.

And thank you, Secretary James and Secretary Kendall, for being here to discuss this with us and for your service to our country.

I think we can all agree that in the coming years assured access to space is going to continue to be more and more important with each passing year. So I wanted to talk about what you think about the following question as we discuss both the short-term and the long-term considerations that have to be taken into account for a space launch. I am interested understanding how the Department of Defense and, to some extent, defense contractors might be looking toward the horizon for new, perhaps non-traditional forms of space launch technology that might be more cost-effective than our current technology.

So can you discuss any steps the Department might have taken to consider alternative forms of technology, such as advances in solid rocket motors? And do you believe that exploring new launch services, instead of just exploring new

engines, might be the most effective way to end our reliance on Russian space launch technology?

Ms. James: So I definitely believe, Senator, that we need to expand our horizon and keep focusing on the launch capability in its totality, of which the engine is a key component, but it is not the only component. So I will say that up front.

I will also say we are open to whatever types of -- particularly this year with the NDAA written as it is, what other types of rocket propulsion systems in a full and open competitive way could lead to having new competitors and new capabilities to get us to space. That is what this is in part all about. And indeed, the solid motor application is one that there has been an award made under one of these other transaction authorities. So we are open to this.

And there are fantastic developments in the commercial world. In my opening statement, I talked about how we are following them. We are celebrating them. We are putting some of our resources and time and energy toward trying to help them get there from here because we will all benefit from it. So totally open to it and one of the awards went in that direction.

Senator Lee: My understanding is that the market for these small payload launches is growing in the United States and it is also growing around the world. As you know, the

Russians have been converting ICBM motors into launch vehicles for smaller payload missions. And this is kind of a low-cost approach that has attracted a lot of commercial users from around the world, a lot of customers from all over the world, including customers in the United States.

The Air Force, if I am not mistaken, stores more than 800 American ICBMs at a cost of about $17 million per year. At this point in time when the United States is trying to reduce our reliance on Russian companies for space launches and it is also trying to find savings within our defense budget, do you think that we could explore allowing domestic commercial use of our excess ICBM motors as long as proper inventory control measures were put in place? Is that a possibility?

Ms. James: If you will allow me to go back and confirm that. But again, I am open to any of these new ideas. I do not believe, however, that those ICBM motors would have sufficient power to launch the types of satellites that we are talking about in our EELV program, but perhaps there might be other applications that we should be thinking about. So if you will allow me to go back and explore that.

Senator Lee: Okay.

Secretary Kendall, you seem to be nodding. Do you want to add anything to that?

Mr. Kendall: I am not aware of the possibilities

there, but I think it is worth exploring. But I think, as Secretary James indicated, it would be for smaller launches.

We do want to exploit the technologies that are in development like the ones Senator McCain mentioned. But we want those investments to be part of a path to assured launch service providers, and that is the distinction between just spending money on propulsion and hoping that these commercial ventures are successful and ultimately give us what we need or actually getting on a contractual path that gets us there for sure and provides the services that we need. That is the difference between the two approaches we have been talking about.

Senator Lee: Right, right. So it is not just about the motors. It is also with the launch services. And I would appreciate any information you can get back to me on that as a follow-up. And assuming there are some that would work, I question whether it would make sense to prohibit American launch providers from purchasing excess ICBM motors for commercial use while allowing Russians to take all of the business in that market, assuming there would be a market there.

Thank you both and thank you, Mr. Chairman.

Chairman McCain: Senator Shaheen I am told is on her way back. So I will just mention a couple things.

We are going to have the various organizations that are

developing these new technologies, including reusable rocket engines and others, before the committee.

For the record, Secretary Kendall, you have said that it costs tens of millions, hundreds of millions of dollars extra if we just went with the Atlas rocket. I would like a much more definitive answer as to how much those additional costs are in your view.

By the way, I am confident that one of these outfits is going to develop a reasonable rocket engine. They have already had success and they predict it. That then, of course, changes your estimates rather dramatically. That is why we need them before the committee.

Jeff, did you have any additional questions or comments?

Senator Sessions: No. Thank you, Mr. Chairman.

Your goal, our goal I think of the committee would be to create a competitive environment where two or more innovative, creative American-based companies are producing our essential launch systems. I think we all agree on that. And the sooner, the better.

And with regard to the $800 million, there are costs for maintaining, Secretary Kendall, the launch systems and the pads and all of that, but in the future, the way you are proposing it, everybody that bids, whether it is SpaceX or Blue Origin or ULA -- they would explicitly put in their bid

that cost. Is that the way they would do it?

Mr. Kendall: We are phasing out that contract, and I do not foresee us using that type of contract again.

Senator Sessions: But they would just have to bid in there -- I mean, they would have to include in their proposal probably the cost of maintaining a launch pad and all --

Mr. Kendall: Yes, they would. And for that reason, we made the adjustment to the current contract so that there is no effective subsidy of ULA any longer.

Senator Sessions: I do think the Senator is right. My best judgment is we are in a transformative time. It would be great. SpaceX is out there doing some great work. I think Blue Origin has great capabilities, and others are talking about some plans that could work too.

So thank you, Mr. Chairman.

Chairman McCain: Well, thank you.

I would just point out my rough estimate between 2005-2016 -- that is about $7.2 billion we have paid ULA -- that math may be wrong -- for staying in business. There is plenty of corporations that do business with the Defense Department we do not pay $800 million a year just to stay in business. They do research. They do development. They do testing. They do work. And yet, this $800 million a year, and then not even bid on a launch. You talk about in your

face.

I am sorry. I do not think we can wait much longer.

Go ahead.

Senator Reed: Just let me make a brief statement.

First, thank you, Mr. Chairman. I think the hearing has been very, very insightful.

If Senator Shaheen -- I will immediately yield to her if she arrives.

Just one of the things that was revealed in the hearing is the complexity of all these issues. One aspect of this, for want of a better term, is reliability because a lot of this effort began in the late 1990s when we suffered a series of significant setbacks, not only billions of dollars of equipment, but intelligence capabilities that were absolutely critical and vital were lost.

I do not know what the scientific correlation is but innovation is -- there is a little tradeoff between reliability and innovation in sort of a street-wise sense. So I just want to simply say that that is one of the aspects that I think we have to look at.

This has been a very important hearing, and the chairman's leadership has been I think in exactly the right direction. We are all sitting here saying we have got to stop buying RD-180s, do it smartly and do it quickly. And that is the point the chairman has made repeatedly.

Chairman McCain: We cannot impose on the time of the witnesses any longer. My regrets to Senator Shaheen.

This hearing is adjourned. I thank the witnesses.

[Whereupon, at 11:03 a.m., the hearing was adjourned.]