

Stenographic Transcript  
Before the

Subcommittee on Strategic Forces

COMMITTEE ON  
ARMED SERVICES

**UNITED STATES SENATE**

HEARING TO RECEIVE TESTIMONY ON  
MILITARY SPACE OPERATIONS, POLICY, AND PROGRAMS

Wednesday, March 27, 2019

Washington, D.C.

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WASHINGTON, D.C. 20005  
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2 MILITARY SPACE OPERATIONS, POLICY, AND PROGRAMS  
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4 Wednesday, March 27, 2019  
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6 U.S. Senate  
7 Subcommittee on Strategic Forces  
8 Committee on Armed Services  
9 Washington, D.C.  
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11 The subcommittee met, pursuant to notice, at 2:29 p.m.  
12 in Room SR-222, Russell Senate Office Building, Hon. Deb  
13 Fischer, chairman of the subcommittee, presiding.

14 Members Present: Senators Fischer [presiding], Cotton,  
15 Rounds, Cramer, King, Heinrich, Manchin, and Jones.  
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1           OPENING STATEMENT OF HON. DEB FISCHER, U.S. SENATOR  
2 FROM NEBRASKA

3           Senator Fischer: Hearing will come to order.

4           I'd like to welcome everyone to the Strategic Forces  
5 Subcommittee's first open hearing of the 116th Congress.

6           We meet today to receive testimony on the national  
7 security space enterprise. Appearing before the  
8 subcommittee, we have General David Thompson, Vice Commander  
9 of Air Force Special Command; General John Thompson,  
10 Commander of the Space and Missile Systems Center; Mr. Ken  
11 -- is it --

12          Mr. Rapuano: Rapuano.

13          Senator Fischer: -- Rapuano, the Assistant Secretary  
14 of Defense for Homeland Defense and Global Security; and Ms.  
15 Cristina Chaplain, who directs the Government Accountability  
16 Office's work on military space programs.

17          Thank you all for your service and for being here  
18 today.

19          We meet at a time of increased focus on the space  
20 domain. In the last few years, we have seen a significant  
21 evolution in our approach to space. It's now widely  
22 recognized that space is a warfighting domain. It is also a  
23 domain in which adversaries are increasingly active and upon  
24 which our Nation increasingly depends. Accordingly, we must  
25 ensure that our military space operations, policies, and

1 programs are keeping pace with the changing environment, and  
2 we look forward to the testimony from our witnesses about  
3 the Department's effort in this regard. Their testimony  
4 today will help the subcommittee make informed decisions as  
5 we continue to craft the defense authorization bill for  
6 fiscal year 2020.

7 I would also like to note for my colleagues that the  
8 full committee will be holding a hearing on April 11th to  
9 discuss the Department's proposal to establish a Space  
10 Force. With that in mind, it is my intention to use my time  
11 today to talk about some of the other key equities in the  
12 national security space portfolio.

13 And, with that, I would turn to my colleague and  
14 Ranking Member, Senator Heinrich, for any comments.

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1           STATEMENT OF HON. MARTIN HEINRICH, U.S. SENATOR FROM  
2 NEW MEXICO

3           Senator Heinrich: Well, first, let me thank Chairwoman  
4 Fischer for holding today's hearing. This is our first  
5 together, and I look forward to future interactions on this  
6 subcommittee.

7           Let me also thank our witnesses for taking the time to  
8 testify today. Between this subcommittee hearing on the  
9 fiscal year 2020 budget proposal and the full-committee  
10 hearing on the proposed Space Force, there will be much to  
11 talk about, relative to space, in the coming weeks.

12          At today's hearing, I want to concentrate on the threat  
13 we face in space, the budget submission to counter these  
14 threats, and organizational proposals to train and equip our  
15 space personnel.

16          The idea of a Space Force is not new. The House  
17 proposed an almost identical concept in their fiscal year  
18 2018 defense authorization bill. It was dropped in  
19 conference. The Pentagon leadership opposed it, and as did  
20 several of our Senate colleagues. Having said that, it's no  
21 secret that the space domain is critical to our military  
22 operations, to our economy, and our way of life.

23          As our adversaries become increasingly active in space,  
24 we certainly can't sit idly by. We must, instead, move with  
25 a greater sense of urgency and purpose. As an engineer, I

1 continue to prioritize research and development, and cannot  
2 stress enough the importance of fostering a culture of  
3 innovation and rapid acquisition within the space domain.  
4 Whether it's the creation of a Space Development Agency or  
5 any larger reorganization, we also should not reinvent the  
6 wheel nor move pieces around for the sake of saying we did  
7 so. We could always strive for our government to be better  
8 stewards of taxpayer dollars and for our military to operate  
9 more effectively, and I look forward to hearing how we may  
10 be able to do so.

11 And again, thank you all for coming today, and I look  
12 forward to hearing all of your testimony.

13 Senator Fischer: Thank you, Senator Heinrich.

14 We will begin with opening statements. I would remind  
15 our witnesses today that your full statement will be  
16 included in the record.

17 Mr. Secretary, if we could start with you, please.

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1           STATEMENT OF HON. KENNETH P. RAPUANO, ASSISTANT  
2 SECRETARY OF DEFENSE FOR HOMELAND DEFENSE AND GLOBAL  
3 SECURITY

4           Mr. Rapuano: Chairman Fischer, Ranking Member  
5 Heinrich, and distinguished members of the subcommittee, it  
6 is a pleasure to appear before you today, along with  
7 Lieutenant General "DT" Thompson, Lieutenant General "JT"  
8 Thompson, and Ms. Cristina Chaplain.

9           Space is a vital national interest. It underpins our  
10 economy and way of life, supporting our academia,  
11 agricultural, banking, and travel sectors, among others.  
12 Moreover, the rapidly growing commercial space sector offers  
13 enormous promise for the prosperity of Americans and our  
14 global partners. Commercial entities led by the United  
15 States are developing and delivering new space technologies  
16 and capabilities at a speed never seen before. Space is  
17 also crucial to the defense of the United States and our  
18 allies and partners.

19           As outlined in the National Defense Strategy, long-term  
20 strategic competition is the central challenge to the United  
21 States prosperity and national security. Space is key to  
22 this competition. China and Russia are developing military  
23 capabilities, doctrine, and organizations intended to place  
24 U.S. space systems at risk. They are developing a suite of  
25 anti-satellite weapons, including ground-launch missiles and

1 directed-energy weapons, and continue to launch experimental  
2 satellites that conduct sophisticated on-orbit activities to  
3 advance their counterspace capabilities. Many of these  
4 systems could be employed in the gray zone, that is  
5 activities below the threshold of armed conflict in a manner  
6 designed to hold U.S., allied, and partner capabilities at  
7 risk and limit our response options.

8         The emergence of new major state actors in space, and  
9 the pace of the technological development, are changing the  
10 character of warfare, presenting new challenges and  
11 opportunities to military space forces. No longer do space  
12 systems simply enable terrestrial forces to fight and win  
13 wars. Actions in space also will directly contribute to the  
14 outcome of future conflicts. In order to preserve peace and  
15 deter aggression, the Department of Defense must adapt.  
16 Without change, the United States is at risk of losing its  
17 comparative advantage in space. A loss of freedom to  
18 operate in space would undermine our Nation's prosperity and  
19 erode the ability of the Joint Force to deter aggression,  
20 protect critical national defense and economic functions,  
21 assure our allies and partners, and project power globally.  
22 While the U.S. would prefer that space remain conflict-free,  
23 we must recognize rising challenges, and overcome them. The  
24 Department must do more to accelerate its response to the  
25 changing dynamics of space by adapting our organizations,



1 policies, doctrine, capabilities, and Joint Force employment  
2 to more effectively deter aggression, protect our interests,  
3 and enhance our lethality.

4 Earlier this month, the Department provided Congress  
5 with a legislative proposal for the establishment of the  
6 U.S. Space Force as a new branch of our Armed Forces. If  
7 authorized, the Space Force will transform our approach to  
8 space by providing singular focus to maintaining and  
9 increasing our advantage in countering current and future  
10 threats. Establishing a sixth branch of our military with  
11 dedicated leadership will unify focus and accelerate the  
12 development of space doctrine, capabilities, and expertise  
13 to outpace future threats, institutionalize advocacy of  
14 space priorities, and further build space warfighting  
15 culture. The role of providing Joint Force employment of  
16 space capabilities lies with the U.S. Space Command, a  
17 unified combatant command focused on planning and executing  
18 joint space warfighting operations. Establishing U.S.  
19 SPACECOM will bring full-time operational focus to securing  
20 the space domain and streamline command and control for  
21 time-sensitive operations.

22 Additionally, the Department of Defense has undertaken  
23 a series of space acquisition reforms. These reforms, such  
24 as SMC 2.0, will continue to mature with the establishment  
25 of a Joint Space Development Agency dedicated to rapidly

1 developing and fielding next-generation military space  
2 capabilities. The SDA will be empowered to go fast, and  
3 would be pursuing a development of a transformational new  
4 architecture that leverages the investment taking place in  
5 the commercial sector.

6       The Department looks forward to working closely with  
7 this committee and all of Congress to ensure that we  
8 maintain our freedom of operation in space to support our  
9 national security, our economic prosperity, and our way of  
10 life.

11       Thank you.

12       [The prepared statement of Mr. Rapuano follows:]

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1           Senator Fischer: Thank you, Mr. Secretary.

2           General "JT" Thompson, welcome.

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1           STATEMENT OF LIEUTENANT GENERAL JOHN F. THOMPSON,  
2 USAF, COMMANDER, SPACE AND MISSILE SYSTEMS CENTER, AIR FORCE  
3 SPACE COMMAND

4           General John Thompson: Thank you, ma'am.

5           Chairman Fischer, Ranking Member Heinrich, and  
6 distinguished members of the committee, I am Lieutenant  
7 General "JT" Thompson, and I am honored to appear before you  
8 today in my capacity as the Commander of Air Force Space and  
9 Missile Systems Center and the Air Force Program Executive  
10 Officer for Space.

11           First of all, I'd like to apologize to you on behalf of  
12 the United States Air Force. Today, we provided two  
13 witnesses for the same hearing, both named Thompson, both  
14 lieutenant generals in leadership positions within Air Force  
15 Space Command. Since my primary duty location is Los  
16 Angeles Air Force Base in Los Angeles, California, and my  
17 fellow witness, Lieutenant General "DT" Thompson's duty  
18 location is here in the national capital region, feel free  
19 to refer to me as "West Coast Thompson" and "DT" as "East  
20 Coast Thompson." That's exactly what leadership does in the  
21 Pentagon.

22           At SMC, I am honored to lead the 6,000 dedicated men  
23 and women, military, government civilians, and contractors,  
24 who collectively have over 100,000 years of national  
25 security space acquisition experience. The SMC workforce is

1 dedicated to providing premier national security space  
2 assets to support joint and allied forces for our Nation.

3 While America is absolutely the best in space, our  
4 adversaries have recognized the extent to which our space  
5 capabilities provide a strategic advantage, and are working  
6 to deny the use of our capabilities with asymmetric  
7 advantages of their own. The space acquisition enterprise  
8 must adapt to deliver capabilities to outpace the threat.  
9 In order to meet the objectives of the National Defense  
10 Strategy, the Air Force is prioritizing investments in  
11 resilience, reconstitution, and operations.

12 The Air Force space enterprise has greatly benefited  
13 from acquisition reforms instituted by the Congress.  
14 However, in order to truly address the threat, we must go  
15 farther. Recognizing the pace of space acquisitions was too  
16 slow, making it difficult to respond to the latest threats,  
17 we are changing the way we do business to get capability  
18 from the lab to the warfighter faster and smarter.

19 Specifically, to speed up the pace of acquisitions,  
20 we're utilizing alternative congressionally approved  
21 acquisition approaches, like other transaction authorities  
22 and rapid prototyping, which was granted under Section 804  
23 of the Fiscal Year 2016 National Defense Authorization Act.

24 SMC is also benefiting from the delegation of authority  
25 for some major defense acquisition programs down to the

1 service acquisition level. With the help of Congress, the  
2 Air Force stood up the Space Rapid Capabilities Office, or  
3 Space RCO, which will continue to work in close concert with  
4 SMC to rapidly develop and acquire critical capabilities.  
5 Further, I delegated acquisition authorities for acquisition  
6 category-3 programs down to the executive level within SMC  
7 simply to speed decisionmaking. And finally, with the  
8 support of the Secretary of the Air Force and the Acting  
9 Secretary of Defense, SMC is undergoing a full  
10 transformation on how we operate, known as SMC 2.0.

11 Although we have a strong history with partnerships  
12 with numerous DOD and intelligence community space  
13 activities, including the National Reconnaissance Office,  
14 Air Force Research Lab, NASA, and the National Oceanographic  
15 and Atmospheric Administration, under SMC 2.0, one of our  
16 principal tenets is to grow even greater partnerships with  
17 our allies, our sister civil and intelligence agencies, and  
18 commercial industry to speed up the pace of acquisition and  
19 our Nation's legacy as the dominant space power.

20 I am grateful for the support of this committee and the  
21 Congress as we transition our space assets to meet and  
22 outpace the threat posed by near-peer adversaries.

23 Thank you for the opportunity to discuss and defend the  
24 vital programs that SMC acquires to enable warfighting  
25 capabilities across the globe. I look forward to your

1 questions.

2 Thank you.

3 [The prepared statement of General "JT" Thompson  
4 follows:]

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1           Senator Fischer: Thank you, General.

2           Next we have General "DT" Thompson. And I believe you  
3 are referred to now as "East Coast." But, General, welcome.

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1           STATEMENT OF LIEUTENANT GENERAL DAVID D. THOMPSON,  
2 USAF, VICE COMMANDER, AIR FORCE SPACE COMMAND

3           General David Thompson: Yes, ma'am, thank you.

4           Chairman Fischer, Ranking Member Heinrich, and  
5 distinguished members of the committee, I'm honored to  
6 appear before you along with these distinguished colleagues  
7 today.

8           And today, I represent our commander, General "Jay"  
9 Raymond, the Commander of Air Force Space Command. I'm  
10 privileged to be one of the 26,000 men and women of that  
11 Command who serve under General Raymond's leadership. These  
12 men and women remain the best in the world at developing,  
13 fielding, operating, and sustaining vital space capabilities  
14 that serve our national leaders, our Joint Forces, allies,  
15 and partners, and the world, in general. The asymmetric  
16 advantage these capabilities provide ensure that our Armed  
17 Forces have no equal.

18           Today, there is unprecedented agreement among the  
19 Nation's leadership that space is a warfighting domain, just  
20 like air, land, sea, and cyberspace. The National Security  
21 Strategy and National Defense Strategy reflect this reality,  
22 emphasizing peace through strength while demanding that we  
23 maintain U.S. leadership and freedom of action in the space  
24 domain.

25           Accepting that potential adversaries have made space a

1 warfighting domain, we are now dealing with the  
2 implications. We are driving tremendous change in order to  
3 sustain our leadership and that freedom to operate in space.  
4 With your strong support, we are making significant advances  
5 to ensure the national security space enterprise is prepared  
6 to play its role in military operations under all  
7 conditions.

8         The fiscal year 2020 budget builds on our efforts over  
9 the past 2 years, proposing a 17-percent increase in space  
10 funding over 2019, and a \$14 billion investment overall.  
11 With my posture statement on the record, I'd like to  
12 summarize a few of its key points:

13         First of all, we're increasing the lethality and  
14 readiness of our force as we continue to invest in and  
15 accelerate defendable space. Among that includes new, more  
16 defendable systems and architectures, the space domain  
17 awareness and command and control needed to operate in a  
18 contested domain, and an operational training infrastructure  
19 to develop space warfighters to the need. All of this  
20 enables us to sustain superiority in space so that we ensure  
21 we support joint warfighters operating in all domains around  
22 the globe.

23         Second, we are enhancing and expanding partnerships  
24 with the intelligence community, allies and partners, and  
25 industry. This includes joint programs with the National

1 Reconnaissance Office, hosted payloads with several of our  
2 allies and partners, and operations, training, exercises,  
3 and wargames with allies that are building a coalition of  
4 like-minded nations.

5 Finally, we're capitalizing on innovative business  
6 practices, including the rearchitecting of Space and Missile  
7 Systems Center that "West Coast Thompson" mentioned and is  
8 leading, establishing a Space Rapid Capabilities Office,  
9 pursuing special practices and innovative agreements that  
10 drive those innovative activities across the broader  
11 commercial and industry base, and, finally, adopting open  
12 architectures and standards to strengthen integration in  
13 multidomain command and control and with the operations of  
14 the rest of the Joint Force.

15 Let me close by reiterating that we do not want war to  
16 extend to space. But, the best way to deter that from  
17 happening is to prepare to fight and win, should deterrence  
18 fail. With your support, that's exactly what we're doing.

19 Thank you again for the opportunity to testify. And I  
20 look forward to your questions.

21 [The prepared statement of General David Thompson  
22 follows:]

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1           Senator Fischer: Thank you, General.

2           Next, Ms. Chaplain. Welcome.

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1           STATEMENT OF CRISTINA T. CHAPLAIN, DIRECTOR,  
2 ACQUISITION AND SOURCING MANAGEMENT, GOVERNMENT  
3 ACCOUNTABILITY OFFICE

4           Ms. Chaplain: Chairman Fischer, Ranking Member  
5 Heinrich, and members of the subcommittee, thank you for  
6 inviting me today to discuss DOD's space programs.

7           Space is of a -- at a pivotal point right now. In the  
8 face of growing threats and lengthy development cycles, DOD  
9 is embracing new approaches to help speed up acquisition of  
10 space systems, establish better partnerships with the  
11 commercial sector to increase innovation, and change its  
12 acquisition culture. There is also a proposal before  
13 Congress on strengthening leadership for space.

14           Bringing about this broad span of change will be  
15 challenging, to say the least, and not without some risk.  
16 More specifically, while DOD is undertaking this change, it  
17 will need to concurrently focus on completing older programs  
18 that are still struggling. The ground system for GPS, known  
19 as OCX, for example, is nearly 5 years late. And, while the  
20 contractor has improved the pace of building and testing the  
21 software, we still see a lot of schedule risk in that  
22 program. The Air Force also recently stopped development  
23 work on JMS, a ground system for processing space  
24 situational-awareness data, because it didn't deliver as  
25 expected. We're also still faced with long gaps between the

1 delivery of satellites and ground systems needed to make use  
2 of their capabilities.

3       Moreover, there's a myriad of challenges facing space  
4 programs that are just getting underway:

5       First, even with the new Space Force proposal, there  
6 are still a lot of open questions about leadership. For  
7 example, at this time, it appears there will be a number of  
8 space acquisition activities outside of the Space Force,  
9 including the Missile Defense Agency, the NRO, and some  
10 military space service activities, but, so far, it's  
11 uncertain what the overall governance structure will be. If  
12 there are conflicts in requirements, funding, or priorities  
13 between agencies that are not under the Space Force, who  
14 resolves them and makes a final decision? There is also a  
15 new entity being rolled out, the Space Development Agency,  
16 which has very worthwhile goals of developing or adopting  
17 innovative technologies for space, but, at this time, it's  
18 unclear how it will mesh with other similar agencies, and  
19 also still unclear who's in charge of future architectures  
20 for space. These questions may well be resolved as details  
21 for the Space Force and SDA get worked out, but new programs  
22 will be operating with uncertainty for the time being.

23       Second, while streamlining my help speed up programs  
24 and change the culture, we know, from past efforts to  
25 streamline, that there's also risk of inviting programs to

1 move too quickly and disregard the engineering and  
2 acquisition discipline that is so very important to space.  
3 Keep in mind that space is different than other types of  
4 weapons. You cannot easily fix satellites once they're in  
5 orbit. We consistently see programs suffer major setbacks  
6 because one quality procedure wasn't followed or one small  
7 flaw in one small part was not detected. This does not mean  
8 streamlining cannot be done, or should not be done. It just  
9 means we should heed lessons from the past, maintain good  
10 insight, oversight, and expertise, and be prepared to cancel  
11 programs that falter.

12       There's a question about DOD's capacity to manage  
13 multiple new programs concurrently. Yes, there's a healthy  
14 increase being proposed for space, but consider at least  
15 nine significant programs are getting underway. They will  
16 likely require heavy investments up front and then DOD will  
17 also be seeking money for a new Space Force, for space  
18 protection, for a Space Development Agency, and a new  
19 missile-defense space layer, as well as for priorities  
20 outside of space, such as the nuclear triad.

21       There are also questions about workforce capacity. We  
22 recently reported that just tracking who's in the space  
23 acquisition workforce is a challenge, and there are also  
24 gaps in technical expertise that will be stretched with  
25 multiple new programs.

1           Moreover, all of the programs will be software-  
2 intensive -- these new programs -- but DOD has challenges  
3 managing software. We recently found that space software  
4 programs struggle to effectively engage system users, which  
5 is critical to their success. We understand that many new  
6 programs are attempting to be more agile and to use more  
7 modern tools, but it remains to be seen how successful DOD  
8 can be in adopting these new ways.

9           Again, good things are happening in space. There's  
10 attention from highest levels of government, more resources,  
11 and a recognition that different approaches and culture are  
12 needed. What's key to making this happen is not to lose  
13 focus on improving acquisition management and oversight,  
14 building capacity as we speed up programs, and continuing to  
15 reduce fragmentation.

16           Thank you. This concludes my statement, and I'm happy  
17 to answer any questions you have.

18           [The prepared statement of Ms. Chaplain follows:]

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1           Senator Fischer: Thank you very much.

2           Thank you all for your opening statements. We'll begin  
3 questioning for the first round.

4           I have a question for General Thompson, West Coast. As  
5 I'm sure you're aware, arguments are being made in the press  
6 against the way the Air Force has structured its efforts to  
7 replace the RD-180 and develop the next generation of launch  
8 systems. And I know that the terms of phase 2 have not been  
9 finalized as of yet, so we have to be careful to keep our  
10 discussion very general. But, I would ask that you talk us  
11 through some of the tradeoffs that we need to keep in mind  
12 when we hear arguments against down-selecting the two  
13 providers or questioning the intent to split launches on  
14 that 60-40 between them. So, help us understand some of the  
15 original thinking behind the way that this was structured,  
16 please.

17           General John Thompson: Thank you, Chairman. That's a  
18 fantastic question.

19           You know, 5 years ago, the Congress challenged us to  
20 get off Russian-made RD-180s and assure access to space  
21 using two domestic launch providers capable of launching to  
22 our most stressing national security space orbits. The Air  
23 Force rose to that challenge, competitively awarding  
24 technology maturation, rocket propulsion system and launch  
25 vehicle service agreements to mature commercial technologies

1 and capabilities for national security space assets.

2 Industry rose to that challenge, as well.

3 We are ready to issue an RFP for the launch service  
4 procurements. All potential offerors -- offerors have  
5 sufficient maturity, and we expect a full and open and  
6 robust competition. Award is anticipated in the spring of  
7 2020. Offerors will be able to update their proposals  
8 throughout the evaluation period if they have technological  
9 maturities or design review completions. We're confident  
10 we're on the right path for our Nation's warfighting  
11 capability, and we're -- that we're being good stewards of  
12 the taxpayers' dollars.

13 Madam Chairman, when you referenced the 60-40 split,  
14 the 60-40 split is really essential for us, for three  
15 reasons. Number one is, it gives us flexibility on the  
16 manifest to be able to move some of our Nation's most  
17 important satellites from provider to provider. Number two,  
18 it's almost like a block-buy concept, where we're able to  
19 take advantage of competition and savings while still  
20 rewarding the best offeror. And then, finally, which is  
21 something that I really need to articulate to everyone, is  
22 that 60-40 is a two-way split. A number of folks have asked  
23 us if it's possible to split it three ways. Our launch  
24 manifest that we need to purchase between 2020 and 2024  
25 simply does not support three offerors in that trade space

1 at the same time. None of the offerors' business cases  
2 would close if we tried to open it up to three different  
3 offerors.

4 Now, as we move forward, after we take a look at the  
5 proposals and have details based on those proposals and what  
6 the technical approaches are, after we've assessed those  
7 risks, when we make the award next spring, then my guess is  
8 that we'll have an opportunity to discuss, for those  
9 offerors that did not receive awards, that -- how we will  
10 keep them in the game so that they can compete for phase 3,  
11 which would be our next launch service procurement in the  
12 future.

13 Senator Fischer: If I'm hearing you correctly, sir,  
14 are you saying that, due to the amount of business that  
15 would be available, having three companies might not be  
16 sustainable, and it would be, in your view, healthier -- or  
17 better to have two companies that are healthy and able to  
18 move forward through this process?

19 General John Thompson: Chairman, that's absolutely  
20 correct, from the standpoint of the national security space  
21 portfolio. There are also commercial kinds of activities  
22 that other offerors could participate in. Whether or not  
23 the commercial industrial base in that time period will  
24 support three launch providers, I would have to take for the  
25 record and get back to you.

1 [The information referred to follows:]

2 [SUBCOMMITTEE INSERT]

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1           Senator Fischer: Thank you. That will be helpful.

2 Thank you.

3           Also, General, the Air Force has talked about the  
4 development of the next-generation --

5           I'm going to hold this question till the next round. I  
6 see I'm out of time. Thank you.

7           Senator Heinrich. I'm not going to abuse my power.

8           [Laughter.]

9           Senator Heinrich: We'll save that for another day.

10          Senator Fischer: Another day.

11          Senator Heinrich: Lieutenant General "JT" Thompson,  
12 you used the term "block buy" in reference to the 60-40  
13 split. So, that begs the question, I think, to you, Ms.  
14 Chaplain -- the Air Force has a long history of launch block  
15 buys. Can you describe those and what issues you saw in  
16 them, in terms of pricing and competition, that we should be  
17 thinking about?

18          Ms. Chaplain: Yes. Like you say, it's been a long  
19 history. When they were about to do their last set of block  
20 buys, there was -- we reported on a lot of issues, in terms  
21 of the knowledge not being there that they needed --  
22 pricing, cost, manifest, things of that nature. And it --  
23 those emanated from the nature of EELV and how it started as  
24 a commercial-like acquisition, that you couldn't obtain  
25 certain pieces of knowledge under the contracts that they

1 had. But, when you neck down to one provider, that became  
2 an issue. The Air Force did listen to our recommendations  
3 at the time, regrouped, got the knowledge it needed to make  
4 that block buy. But, there's always a risk, going forward,  
5 if you're going to be awarding fixed-price contracts with  
6 limited information, and you somehow end up with one  
7 provider again, that you might be back in that same  
8 situation, in terms of having the right insight.

9 One concern we have with the approach, going forward,  
10 is, it -- there may not be enough commercial launches for  
11 three providers, there might not be enough to sustain two.  
12 So, that's a question, given the demand on the DOD side and  
13 what assumptions we have about the commercial sector, and  
14 how hard it is just to predict what's going to happen in the  
15 commercial sector.

16 Senator Heinrich: Lieutenant General Thompson -- "JT"  
17 Thompson, why -- give us some insight into how you're  
18 confident that it will support two. And then, are you also  
19 confident that, if -- that the -- these long-term blocks  
20 will be cost-competitive?

21 General John Thompson: So, Senator, in terms of why  
22 we're confident that we will be able to support two is, we  
23 know, essentially, the manifest that we have to support in  
24 the 2020-through-2024 timeframe, in terms of when we would  
25 purchase the rockets, and that -- or when we would purchase

1 the services -- and then from 2022 to 2026, when those  
2 rocket services would actually launch. We know that we have  
3 anticipated what the costs would be, and we're confident  
4 that we can support two, with a 60-40 split, through the  
5 National Security Space Launch Program.

6 Senator Heinrich: In followup to that -- I'm trying to  
7 understand something that happened last week, on March 20th.  
8 The Air Force released a Notice of Intent for early  
9 integration studies.

10 General John Thompson: Yes, sir.

11 Senator Heinrich: And all four contractors competing  
12 for launch services were listed, including SpaceX. Does  
13 that at all -- does that study reopen the opportunity for  
14 SpaceX or the next down-selected to compete for Federal  
15 funding? Or what is the impact with -- what is the impact  
16 of that early integration study --

17 General John Thompson: Senator, the early --

18 Senator Heinrich: -- as to all four contractors?

19 General John Thompson: -- the early integration  
20 studies are, basically, a standard operating procedure that  
21 we use 3 years before we award a satellite launch. It's,  
22 essentially, low-dollar study money for vendors to be able  
23 to begin working with satellite providers to understand the  
24 satellites that are on the manifest that year and what the  
25 interface requirements and technical terms are between the

1 rocket and the satellite, the launch vehicle and the  
2 satellite vehicle.

3       Senator Heinrich: Let me switch to Space RCO.  
4 Obviously, what we used to call Operationally Responsive  
5 Space, now Space RCO, was really designed by Congress to be  
6 disruptive. And, in fact, Congress had to fight the  
7 Department from terminating the office, in my view, for most  
8 of a decade, because it was so disruptive. Today, it seems  
9 that leaders in the Pentagon really value that disruption.  
10 So, Lieutenant General "DT" Thompson, I want to ask you, if  
11 Space RCO were provided the appropriate resources, would  
12 they be able to conduct missions, like building a network of  
13 small satellites in low-Earth orbit with a mix of  
14 communications, gear, and sensors designed to detect  
15 hypersonic weapons?

16       General David Thompson: So, Senator Heinrich, first of  
17 all, thank you for that question. And I would say, up  
18 front, yes, that acquisition organization, and any other  
19 organization with the right resources, would be able to  
20 pursue that activity.

21       If I would -- if I -- I'd like a few minutes to talk a  
22 little bit more about Space RCO. First of all, as you  
23 noted, with the help of Congress, we have succeeded in  
24 turning the operational -- operationally responsive space  
25 office into a true rapid acquisition organization. In



1 addition, with the change directed by Congress, we  
2 rearchitected and reresourced the entire office. It is now  
3 focused on what I will call space superiority programs that  
4 don't have a home anywhere else in the acquisition  
5 enterprise today, but are urgently needed to help us with  
6 our defend-and-protect missions. We've got the people we  
7 need, we have resources. It is crafted and shaped after the  
8 Air Force RCO model, with an Air Force Board of Directors  
9 led by the Secretary of the Air Force, streamlined  
10 authorities, streamlined decisionmaking processes. So, it  
11 is up and running, effective, and helping us with our most  
12 urgent defend-and-protect priorities.

13 But, yes, it could also take on other responsibilities,  
14 in that sense, if appropriately resourced.

15 Senator Heinrich: And, Madam Chair, I apologize. Now  
16 I've abused my time.

17 Senator Fischer: Never. Thank you, Senator.

18 Senator Rounds.

19 Senator Rounds: Thank you, Madam Chair.

20 For General "JT" Thompson, first of all, how many RD-  
21 180 motors do we have in hand right now?

22 General John Thompson: So, we currently have -- I  
23 believe the number is 12. I can confirm that, for the  
24 record, for you, sir.

25 [The information referred to follows:]

1 [SUBCOMITTEE INSERT]

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1 Senator Rounds: How many do you --

2 General John Thompson: There were --

3 Senator Rounds: -- intend to purchase?

4 General John Thompson: -- there were 15, but, in our  
5 most recent source selection, we awarded three. So, there's  
6 12 remaining, out of the 18 that we're authorized for  
7 National Security Space Launch Program.

8 Senator Rounds: So, we had a total of 18 that were  
9 being -- that we had authorized. You've currently used --

10 General John Thompson: We current use six.

11 Senator Rounds: -- six of them. So -- okay.

12 General "DT" Thompson, with regard to the command and  
13 control and the need for your cyber operations to be  
14 integrated within this, where is the responsibility for the  
15 cybersecurity laid? Is that within a separate order, or are  
16 you finding that within the cyber mission forces that we  
17 have today?

18 General David Thompson: So, Senator, actually, it's --  
19 there's elements of both. First of all, inside of Air Force  
20 Space Command, inside of our operational squadrons today  
21 that are operating the satellite, there is a requirement for  
22 what we call mission defense teams organic to the squadrons.  
23 They live and work on the cyber terrain, the command-and-  
24 control systems that we use to command and control the  
25 satellites today. They understand those systems deeply,

1 they have special cyber training and special understanding  
2 of the systems to be what we would call "the beat cops" and  
3 the first line of defense under an initiative we call  
4 Defensive Cyber Operations for Space. That's the Air Force  
5 Space Command responsibility.

6 Then the next tier comes from the cyber mission forces  
7 that -- or organized under the Air Force today under Air  
8 Combat Command, but directed by U.S. Cyber Command. They  
9 take a broader look. They look at the threats out there.  
10 They work with those sorts of persistent threats, and they  
11 are also a resource we can bring in to help us when further  
12 expertise is needing or capabilities that they don't have.  
13 So, it's a layered approach.

14 Senator Rounds: I know, within your discussion points  
15 in your statements, there is clear evidence of the  
16 understanding of the five -- of the multiple domains that we  
17 have: air, land, sea, cyber, and space. We're prepared  
18 today, and we assume that we're in a position to defend  
19 within, as an example, the air domain and -- or the land  
20 domain or the sea domain. And we know what that means, in  
21 that we have weapons capabilities, we have defense  
22 capabilities. Offensively and defensively, we're there.  
23 When you move into cyber, we have offensive and defensive  
24 capabilities. What does it mean in space? Do -- are we in  
25 a position to where we are now acknowledging that, as a

1 domain, we have to have the same types of capabilities, both  
2 offensive and defensive capabilities, or are we restricting  
3 ourselves right now to defensive capabilities only?

4 General David Thompson: So, Senator, I would say, very  
5 clearly, we have acknowledged, with space as a warfighting  
6 domain, we have a special need to defend and protect the  
7 capabilities we have. Because we have those capabilities,  
8 we are so much better at using them and integrating them,  
9 and they provide us such an advantage, we know that, first  
10 and foremost, we need to protect them, because an adversary  
11 is going to try and take those away from, in conflict.

12 What I would say is, we also recognize we need to deny  
13 the use of space to an adversary. We will not restrict  
14 ourselves, and we do not restrict ourselves, to any specific  
15 instrument or tool or medium. We need to be able to respond  
16 at the time, place, and in the manner of our choosing. And  
17 we have a lot of instruments in that regard. Certainly, I  
18 believe that probably the Nation needs more discussion about  
19 what that might mean in the space domain itself.

20 Senator Rounds: Thank you.

21 Ms. Chaplain, I'm just curious. When it comes to the  
22 -- you laid out, really, a series of challenges that the Air  
23 Force has with regard to the operations within space, some  
24 in which we're being successful, some in which we're not and  
25 we're recognizing, in those where we have shut down some

1 systems and so forth. Could you share just a little bit  
2 with regard to what you see as our capabilities for  
3 defending our space capabilities and the challenges that we  
4 have today? And I recognize this is not a classified  
5 setting, but is there a way that you can share with us what  
6 our needs are or what you see as areas that we're lacking  
7 today?

8 Ms. Chaplain: I can share a little bit. We recently  
9 did a review of cyber protection for weapon systems as a  
10 whole, and found that, for weapons in development, they can  
11 be easily hacked in the testing process. And a lot of that  
12 goes to pretty simple things, like password management,  
13 cyber hygiene, patching systems. And there were some space  
14 systems included in our review. So, while, on one hand,  
15 there's a lot of attention being devoted to cyber, a lot of  
16 resources, the Department understands the priority and has  
17 taken a lot of good steps now. I think there's a lot in the  
18 culture that needs to come a ways to just do the basic  
19 things that everybody has to do to protect their systems.  
20 And they're not expensive, and it would put the Department  
21 in a much better place.

22 Senator Rounds: I would note that the Navy most  
23 recently had a similar review, and came up with some  
24 surprising things, as well. So --

25 Ms. Chaplain: Yeah.

1 Senator Rounds: -- I would -- thank you.

2 Thank you, Madam Chair.

3 Ms. Chaplain: Very surprising.

4 Senator Fischer: Thank you, Senator.

5 Senator King.

6 Senator King: Thank you, Madam Chair.

7 I don't want to be argumentative, but I'm skeptical. I  
8 want somebody to explain to me why we need a Space Force,  
9 particularly when it's not going to include NRO, NASA, OSC,  
10 the private launch companies, missile defense. I mean, it  
11 strikes me as a solution in search of a problem. Are you  
12 guys really -- you really can't manage this now, under the  
13 auspices of the Air Force? I'm not anti-, but I'm  
14 skeptical, I guess.

15 Mr. Rapuano: So, Senator, I'll take a first shot at  
16 that.

17 Fundamentally, we are concerned about the risk of  
18 losing our advantage in space.

19 Senator King: So, how does an organizational change of  
20 moving the boxes around affect that, one way or the other?

21 Mr. Rapuano: Well, I would just go further in saying  
22 that, when you look at the paradigm shift in terms of --  
23 historically, we have operated in space in a permissive  
24 environment. We have tremendous dependencies and  
25 capabilities that are space-based or space-enabled. We now

1 have adversaries, peer-level potential adversaries, who are  
2 focused -- quite focused. In fact, in 2015, both of them  
3 reorganized -- China and Russia -- their military for  
4 increased focus on their space capabilities. And they're  
5 looking at how they can negate our advantages in space.

6 Senator King: Well, I certainly understand that. And  
7 today's headline is, "India Successfully Tests Satellite  
8 Killer." I mean, that's this morning. And I understand the  
9 change in the dynamic and offensive and defensive  
10 capabilities. I just don't understand creating a new box  
11 with a new name within the Air Force increases our ability  
12 to deal with these issues. What -- I don't -- that's what  
13 I'm troubled by. I'm not -- I understand the challenge, and  
14 I understand the importance of meeting it, but I don't see  
15 why this -- particularly when it doesn't -- it's not  
16 comprehensive. There's a lot of the space infrastructure  
17 that's not included in this new entity. That's -- I'm just  
18 asking a kind of --

19 Perhaps I ought to ask the -- your office. What does  
20 this gain us, in terms of capability? It just seems to me  
21 it's drawing new boxes and having new people.

22 Ms. Chaplain: Sure. I think there's two sides to it.  
23 One is the threat side and needing to really focus people on  
24 that and prioritize it.

25 Senator King: Are we not focused now?



1 Ms. Chaplain: Well, it's --

2 Senator King: The Air Force isn't paying attention to  
3 this now?

4 Ms. Chaplain: What -- it's part of STRATCOM's mission  
5 to defend space, and it's -- the person running that mission  
6 has a lot of other priorities. So, there's one thought to  
7 segment space in the defense of space to one individual, one  
8 organization. The other thought is just on the acquisition  
9 side. What we reported on is, there's a lot of players  
10 involved in space, there's a lot of fragmentation, and you  
11 find that really affects the ability to get capability out  
12 quickly. There seems to be a lot of disconnects that happen  
13 just because of the way --

14 Senator King: But, it seems to me that's a management  
15 challenge. I -- again, I -- and do you have an estimate of  
16 the incremental cost of creating this entity, over and above  
17 current expenditures for all of these purposes? In other  
18 words, what -- you understand what I mean, the incremental  
19 cost.

20 Ms. Chaplain: Yeah, I think DOD has done its cost  
21 estimate.

22 Senator King: What do you -- what's the number?

23 Mr. Rapuano: So, the first year of the Space Course --  
24 Force would be 72 million. At the end of the FYDP, at the  
25 FY24, it would be up to 500 million annually. And you're

1 talking about 2 billion total over the next 5 years.

2 Senator King: But -- so, 500 million a year, half a  
3 billion dollars a year, in organizational change. And I  
4 guess my -- I mean, are you coming before us, saying, "We  
5 can't manage this now, and we need to spend half a billion  
6 dollars a year"? You understand what I'm asking, I'm sure.

7 Mr. Rapuano: I would say that --

8 Senator King: Convince me that this makes some sense,  
9 that it's worth \$500 million a year.

10 Mr. Rapuano: Again, the transition from operating in  
11 space in a permissive environment, with all of the  
12 capabilities and dependencies, to a warfighting environment  
13 really requires a focused approach. We're doing it at three  
14 legs of the triad, essentially. The first is the U.S. Space  
15 Command. That's the employment of the Joint Force --  
16 operational employment of the Joint Force on a day-to-day  
17 basis.

18 Senator King: Is that going to go away under this  
19 proposal?

20 Mr. Rapuano: No. In fact, it will be a -- it's -- it  
21 was recently directed by the President, and the confirmation  
22 of the Commander of U.S. Space Command is pending with the  
23 Senate. I believe it arrived this week. So, that's the  
24 employment of the force.

25 The critical organize, train, and equip component is

1 the service component. And that really is the doctrine, the  
2 training, the plans, the personnel development. It is the  
3 unified and singular focus on space as a warfighting domain  
4 that is very difficult to achieve unless you have that  
5 unified, sole responsibility and custody --

6 Senator King: I'm out of time, but I -- I'd appreciate  
7 it if you could supply, for the record, a 1- or 2-page  
8 justification for the incremental cost of the organizational  
9 change, and outlining what the tangible benefits will be of  
10 this change.

11 Mr. Rapuano: Yes, I will, Senator.

12 [The information referred to follows:]

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1           Senator King: Because I think a lot of your capability  
2 now -- and I'm not sure this going to add anything.

3           Thank you.

4           Senator Fischer: General Thompson, at one point, you  
5 looked like you wanted to jump into this conversation. And  
6 I think Senator King's looking for an answer. If you'd like  
7 to respond.

8           General David Thompson: Thank you, Madam Chairwoman.

9           Senator King, let me -- I would like to add a little  
10 bit, if I can. And certainly, there are aspects of the need  
11 to fix some of the problems when you talk about the number  
12 of organizations and agencies and activities inside the  
13 Department today that are focused on acquisition, that are  
14 focused on architecture, and focused on some of them. We  
15 certainly need to bring some of that -- unify it, give it  
16 the right purpose and synchronization and direction in a  
17 unifying step.

18           The second is, as Secretary Rapuano mentioned, is the  
19 specific focus of a service staff whose responsibility is to  
20 organize the forces, train them, equip them, and present  
21 them for the warfighting purpose that, in this case, usually  
22 the U.S. Space -- in this case the U.S. Space Command would  
23 operate.

24           But, I would also look at it as not just a "Are we  
25 trying to fix a problem?" It's a question of, "Is the

1 Nation prepared? And are we organized to accept and take on  
2 the challenge that comes with space as a warfighting  
3 domain?" And I would use as an example the -- 1947 and the  
4 formation of the United States Air Force. The War  
5 Department and the Army had done a tremendous job creating  
6 air capabilities that won World War II -- strategic  
7 bombardment, air superiority, tactical support, and military  
8 transport. And so, no one could argue that the War  
9 Department had not done a tremendous job in creating a space  
10 arm, but the Nation decided that, at that time, as we looked  
11 to the future, as the needs and the requirements and  
12 expectations that we expected of airpower, it needed a  
13 separate service, it needed a proponent, it needed a four-  
14 star advocate on the equivalent scale with the other  
15 services. And I would argue, now's the opportunity for the  
16 Nation to look at that, have that conversation, and decide,  
17 if we're in a similar position, to ensure that we're  
18 organized and structured appropriately to meet the  
19 challenges of the future. So, not just a matter of, "Are we  
20 trying to fix problems?" Is this the right structure for  
21 the Nation, going forward, to address these challenges?

22 Thank you.

23 Senator Fischer: Thank you.

24 Senator Cotton.

25 Senator Cotton: Mr. Secretary, which nation -- which

1 nation's armed forces depend most on space?

2 Mr. Rapuano: So, the United States leverages space  
3 more than any country in the world. Our partners and  
4 allies, working with us, in terms of those alliances and  
5 partnerships, have their own developed capabilities, and we  
6 leverage and use them to force-multiply our capabilities.  
7 So, the Five I's -- France, Canada, Australia, New Zealand,  
8 the U.S. -- and a number of other partners have space-based  
9 capability, as well. The South Koreans have some space  
10 capability. And it's multiplying. And, as noted earlier,  
11 the commercial sector has exploded, in terms of scope and  
12 scale of the activities and the speed of the development of  
13 capabilities. So, you're seeing a proliferation of that  
14 technology now spreading much more rapidly than ever before.

15 Senator Cotton: So, it's all good with our allies,  
16 but, ultimately, that comes back to the central position  
17 that space plays in the way we fight wars. What about our  
18 adversaries, Russia and China? How dependent are they upon  
19 space for their armed forces?

20 Mr. Rapuano: So, China has expanded by orders of  
21 magnitude. The Russians have grabbed back, they have newly  
22 invested in space, and have developed some relatively  
23 exquisite capabilities. But, the scale of the Chinese  
24 investment is the lead, in terms of everyone else out there,  
25 including Russia. They have more rocket launches this year

1 than the United States. They're lead rocket-launch nation  
2 in the world.

3 Senator Cotton: How much of that Chinese investment is  
4 designed specifically to counteract the advantage that we  
5 had enjoyed in space over the years?

6 Mr. Rapuano: We are concerned that they are making  
7 significant investments to do that.

8 Senator Cotton: And the -- there's no way to avoid  
9 space being central to our way of war, is there? I mean,  
10 some of it is a legacy based on our technological  
11 advantages, going back to the early days of the space era,  
12 but it's also just the fact that we live in the new world,  
13 and they all live in Eurasia, and we have to project power  
14 across a global scale, which depends on space. And,  
15 secondarily, we have made the choice, over the last 30-to-35  
16 years, to fight information-centric warfare. And I don't  
17 just mean long-range precision strikes or fancy  
18 cyberattacks. What does it mean to a private on the ground  
19 with a rifle if we lose dominance in space?

20 Mr. Rapuano: It's pivotal. Our targeting, our  
21 communications, positioning, timing, location for GPS, and  
22 then all of the ISR capabilities, in terms of surveillance  
23 and reconnaissance that we get from space, realtime  
24 situational awareness of adversaries' locations and  
25 activities. To lose those capabilities would be very

1 significant. And that is why we are so focused on defending  
2 and protecting them.

3 Senator Cotton: Let's talk about defending them.  
4 Where are we today versus, say, where we were a year ago in  
5 our space assets? Are we more or less vulnerable to, say, a  
6 kinetic strike from a anti-satellite missile?

7 Mr. Rapuano: So, we are improving our capabilities  
8 from investments that started several years ago. In fact,  
9 even late in the Obama administration, there were some  
10 significant investments, as you're aware, from this  
11 committee and others. In terms of the details of those  
12 activities, we could discuss that in a closed hearing.

13 Senator Cotton: More or less vulnerable to  
14 cyberattack, both in orbit and on the ground?

15 Mr. Rapuano: As noted earlier, we're very focused on  
16 the cyber piece, so we don't know what we don't know, in  
17 some respects, in terms of what an adversary may be doing,  
18 but we are hardening the entry points, and there are fewer  
19 entry points in space -- some space systems versus other  
20 systems that are more connected and networked. So, we're  
21 making progress there. But, it's a priority, and we are  
22 continuing to approach it quite urgently.

23 Senator Cotton: More or less vulnerable to the kind of  
24 laser attacks that might dazzle or destroy a satellite  
25 system?



1           Mr. Rapuano: So, we are concerned about ground-based  
2 effects on satellites, and we are seeing potential  
3 adversaries invest in them.

4           Senator Cotton: I raise these questions knowing that  
5 you can't get into the greatest detail in this open forum,  
6 but just to highlight the vulnerabilities of our space  
7 systems, both our sensors, but also the critical systems on  
8 which everyone in our military depends, to include that  
9 private out on the ground. We may not want to have a space  
10 race. We may not want to weaponize space or have weapons in  
11 space. But, if our adversaries are competing there, we  
12 don't really get a choice whether we compete. We only get a  
13 choice whether we win or lose.

14           Thank you, gentlemen.

15           Mr. Rapuano: Yes, Senator. Thank you.

16           Senator Fischer: Senator Manchin.

17           Senator Manchin: Thank you, Madam Chair.

18           Thank you all for being here. Sorry, I was in another  
19 committee meeting before I got here, so I'm -- I think this  
20 was covered, but I'm not sure. I wanted to ask.

21           General Thompson, you highlighted a number -- General  
22 John Thompson -- I know there's two -- acquisition programs  
23 and reforms as part of the Space Missile Systems Center. I  
24 think you mentioned 65-percent savings -- 65-percent savings  
25 in the timeline that you laid out sounded good on the

1 surface. Was that correct, in your statement?

2 General John Thompson: Sir, I'm sorry, I -- could I  
3 ask you to rephrase the question?

4 Senator Manchin: The 65-percent savings in timeline  
5 which was laid out --

6 General John Thompson: Oh, sure. Sure. Thank you  
7 very much.

8 Senator Manchin: Okay.

9 General John Thompson: So, what you're referring to is  
10 a rearchitecture that we've done to the Space Missile System  
11 Center, called the SMC 2.0. When I arrived at SMC, about 2  
12 years ago, what I found was a bunch of outstanding people  
13 that really knew the space acquisition business, but they  
14 were organized very hierarchically and in stovepipes by  
15 mission area. There was very little crosstalk between major  
16 programs of record. Decisions took a long time to make,  
17 because they had -- because the decision packages had to  
18 fight their way up through the staff.

19 What we have entertained now is an SMC 2.0 construct,  
20 which turns our -- what I would refer to as an Industrial  
21 Age business-model kind of organization into a new, modern  
22 corporation, something like that you might see in Silicon  
23 Valley. So, a much flatter organization. We've delegated  
24 authority down to senior civilians and senior military  
25 officers who know what they're doing. We've given -- we've

1 added three new program executive officers, in addition to  
2 me, and put them closer to the program offices so that they  
3 can make decisions faster. Making decisions faster -- in  
4 many cases, what we've seen on major program-of-record  
5 milestone decisions is, we've been able to save 60 to 70  
6 percent of the time required by eliminating layers of the  
7 bureaucracy and getting those decisionmakers closer to the  
8 program offices.

9       Senator Manchin: Let me just, maybe -- whoever wants  
10 to answer, but I -- and I think, General Thompson, you've  
11 stay -- either one of you all -- with so many agencies out  
12 there, you know, I'm concerned, because, on the cyber end of  
13 it, espionage and things that's happening, there's so many,  
14 basically, smaller contractors. Once the main contract,  
15 then it goes -- we don't seem to have good oversight or good  
16 -- or good controls of that with their security clearances  
17 and also the programs they're using. And that's where I  
18 think an awful lot of espionage has gone on, and a lot of  
19 cybertheft is going on. And I don't see anybody changing  
20 that or going after that total control on whoever -- if you  
21 have an RFP, and you have a main -- one of your big guys,  
22 that person should be held accountable and responsible for  
23 anybody and everybody they bring onboard. And we're finding  
24 that's not the case.

25       Mr. Rapuano: So, Senator, thank you for that question.

1           We are highly focused on the defense industrial base,  
2 all of those companies who support the development of  
3 Department --

4           Senator Manchin: I understand.

5           Mr. Rapuano: -- of Defense --

6           Senator Manchin: There could be four or five subs.  
7 I'm -- this is just -- my information, we found out that a  
8 lot of -- you all, basically, from the Department of  
9 Defense, goes in to the main contractor. By the time that  
10 contractor goes down to subcontractors, they're all trying  
11 to protect their domain to give them a competitive edge and  
12 -- and making money. It's all fine. But, the security of  
13 our country -- you want to know why China's been able to  
14 ramp up so quick? This is loosey-goosey down here. They  
15 can almost pick up anything, and no one's tightening that  
16 up.

17          Mr. Rapuano: We are in the process of tightening that  
18 up. And part of it are the contract requirements that need  
19 to be modified to ensure that those who are performing on  
20 DOD contracts are required by the contract stipulations to  
21 ensure that cybersecurity --

22          Senator Manchin: I'm told that to -- some of the  
23 smaller subcontractors don't have the wherewithals. So, the  
24 prime should be held totally responsible to make sure that  
25 they have the wherewithals, or they don't work with the

1 subcontractor that doesn't. Nobody's holding anybody  
2 accountable, because the prime can say, "That's a  
3 subcontract," or, "That was subbed out to another sub."  
4 Does that make sense, what I'm --

5 Mr. Rapuano: That is part of the challenge.  
6 Absolutely.

7 Senator Manchin: You all do --

8 Mr. Rapuano: The smaller --

9 Senator Manchin: -- recognize that that's a big  
10 problem.

11 Mr. Rapuano: We do recognize --

12 Senator Manchin: You recognize that basic -- China's  
13 rapid advancement has been because they've been able to tap  
14 into some of our most strategic and confidential and high-  
15 security information, they've been able to get fairly  
16 rapidly, fairly easily?

17 Mr. Rapuano: We see it as a vulnerability, and we are  
18 focused on addressing it.

19 Senator Manchin: I just -- anybody else want to  
20 comment on this? Please do.

21 General John Thompson: Senator, that is a fantastic  
22 question, and we agree 100 percent with you.

23 Senator Manchin: What can we do to --

24 General John Thompson: Sir, General "DT" Thompson and  
25 I happen to work with General "Jay" Raymond, who is the

1 current Air Force Space Command Commander, and he has made  
2 it abundantly clear, to both "DT" and I, in very forceful  
3 manner, that the situation that you state is unsatisfactory.  
4 We have a number of initiatives underway to battle  
5 exfiltrations of our weapon systems data from our cleared  
6 defense contractors. And holding the primes accountable to  
7 ensure that their subs, whether they're one level down, two  
8 levels down, or three levels down, is one of the principal  
9 --

10 Senator Manchin: We're finding out that some of the  
11 primes have no idea, third and fourth and fifth in the  
12 chain, who they are.

13 General John Thompson: Sir, in the acquisition domain,  
14 specifically in the space portfolio, we are working after  
15 that. I would ask you to let me submit something in the  
16 record that gives you the details of that plan.

17 [The information referred to follows:]

18 [SUBCOMMITTEE INSERT]

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1 Senator Manchin: Happy to.

2 General John Thompson: And then, perhaps, if you're  
3 interested, we could go to another forum --

4 Senator Manchin: Senator Rounds and myself --

5 General John Thompson: -- and talk about it in  
6 classified --

7 Senator Manchin: -- have a Subcommittee on Cyber, and  
8 we're getting into procurement. This is a big thing with us  
9 right now, because -- you just have to look back not that  
10 far to find out how China and others have been so successful  
11 at rapidly deploying and getting up to speed at a much  
12 quicker -- you know, they say, except for the second engine,  
13 their F-35 mimics ours to a tee. There's no way to do that,  
14 except being able to get all the pertinent information  
15 needed.

16 I just -- Madam Chairman, we just have a terrific  
17 problem, here. And it goes into procurement, and it goes  
18 all the way down the chain. We don't hold the prime -- we  
19 don't hold the prime, which is the big boys -- and a  
20 subcontractor does not get a contract from them, because  
21 they're not large enough to do it on their own, so they're  
22 -- end up being a sub, and they're held hostage by the  
23 prime. The prime is not held accountable to the sub and  
24 what the sub's doing and how they secure their systems. And  
25 it goes down to second, third, and four tier, you've really

1 got a problem. And I think they realize it. It's been out  
2 there for quite some time. And so, with this -- with your  
3 subcommittee and our subcommittee working together,  
4 hopefully we can make some major changes.

5 Senator Fischer: Hopefully, General Thompson will get  
6 that information to you and to all of us, Senator Manchin,  
7 and then maybe we can follow up and do a classified so we  
8 can get in more to the details on it, if that would be  
9 helpful.

10 Senator Manchin: [Speaking off mic.]

11 Senator Fischer: Okay. Thank you, Senator Manchin.

12 Senator Hawley.

13 Senator Hawley: Thank you, Madam Chair.

14 Mr. Secretary, I want to go back to something you said  
15 to Senator Cotton. You said that China has expanded its  
16 capabilities in space by orders of magnitude. I just wanted  
17 to dig into that a little bit more. The DIA produced an  
18 unclassified report this past January, "Challenges to Space  
19 Security," in which it described a number of disturbing  
20 patterns of our competitors. China, it appears, is  
21 directing a Asia-Pacific Space Cooperation Organization.  
22 And I'd note that the rotating membership includes nations  
23 like Iran and Pakistan. Russia, this report says, has the  
24 largest foreign network of ground-based optical space  
25 surveillance sensors in its Keldysh Institute of Applied



1 Mathematics, coordinates sensor tasking and fuses  
2 information from nearly 100 ground-based optical sensors on  
3 40 observatories spread across 16 countries. Is it fair to  
4 say that China and Russia have a coordinated international  
5 effort to threaten the United States in and from space?

6 Mr. Rapuano: With regard to complicity between China  
7 and Russia, less clear, but, in terms of the objectives of  
8 both -- of, individually, China and Russia, absolutely.  
9 They are looking to asymmetrically undermine our space  
10 capabilities.

11 Senator Hawley: And this is a top priority for them,  
12 is it fair to say?

13 Mr. Rapuano: Fair to say.

14 Senator Hawley: And they're -- the expenditures that  
15 you were detailing earlier, both from the Chinese and the  
16 Russian government side, shows a renewed emphasis for both  
17 of them on a modern-day space race. Is that fair to say?

18 Mr. Rapuano: That is fair.

19 Senator Hawley: Let me come back to something you said  
20 to Senator King. You were talking about a -- the triad to  
21 approach this issue. You talked about U.S. Space Command,  
22 you talked about the service component. You didn't get to  
23 the third piece.

24 Mr. Rapuano: Yes, thank you. Thank you for asking.

25 The third piece is really about the development. And

1 that's where the space development piece comes in, in terms  
2 of SDA. And it is about, really, leveraging innovation,  
3 it's about leveraging commercial practices and capabilities  
4 that are developed on the commercial side, and it's really  
5 looking at the transformation -- transformational capability  
6 set. So, one of the areas that SDA will be focused on is a  
7 massively distributed sensor communications architecture in  
8 low orbit, in LEO, to be more resilient, degrade more  
9 gracefully under attack, and provide us more reliability, as  
10 well as reconstitution if we lose assets. And that would be  
11 a critical capability fill, in terms of operating in a  
12 warfighting environment, where we have adversaries who are  
13 looking to get at our assets.

14 Senator Hawley: Understood. Let me just ask you a  
15 budget question. Do you think your request for a 56-percent  
16 increase in the space situational awareness part of the  
17 budget is sufficient to meet the threat that we're seeing  
18 from our adversaries?

19 Mr. Rapuano: So, we are comfortable with the  
20 President's \$14 billion request for the next fiscal. We  
21 believe that it covers our major requirement areas.

22 Senator Hawley: General David Thompson, let me ask you  
23 about another piece of the budget. It includes a request  
24 for a 115-percent increase in science and technology, which  
25 seems very wise, given the scale of the challenge that we're

1 facing. I just wonder, Who have been your biggest partners  
2 in this effort, particularly in the research, private-  
3 sector, and startup communities?

4 General David Thompson: So, Senator, thank you. I  
5 would say right now what we're trying to focus on most is  
6 recognize and understanding what's out in the commercial  
7 sector, the innovation that's there in the commercial  
8 market, the emerging commercial market. There are lots of  
9 companies there that are looking at, for example, large-  
10 scale constellations that might be fielded cheaply, with  
11 tremendous capability.

12 So, we're currently looking for a couple of  
13 opportunities. One is the technology that goes with the --  
14 a low-cost space capability, the actual mission performance,  
15 whether it be remote sensing or it be satellite  
16 communications or things like that, but the third thing  
17 we're looking at is opportunities to partner with them for  
18 things like hosted payloads and other things that we might  
19 be able to use mission capability with. So, it's especially  
20 focused on the investment you see in the burgeoning  
21 commercial space sector.

22 Senator Hawley: Have you encountered any particular  
23 difficulties in working with the private sector along these  
24 lines?

25 General David Thompson: We have not. They're -- they

1 are certainly welcome and open to investment. Really, what  
2 is the challenge on our part is twofold. First is picking  
3 the right places to invest for strategic purpose. And then,  
4 obviously, as you talked about, there is certainly an  
5 investment there, but there are always more opportunities  
6 and needs than there are investment dollars. So, making  
7 smart use of our investment dollar.

8 Senator Hawley: Thank you very much.

9 Thank you, Madam Chair.

10 Senator Fischer: General "JT" Thompson [speaking off  
11 mic].

12 General John Thompson: Thank you, Chairman.

13 Senator, just as a quick addition to that, we've tried  
14 to create lower boundaries for entry for a lot of our  
15 commercial partners, our nondefense-oriented, nontraditional  
16 partners that are bringing new, innovative things to the  
17 table. One of our most successful vehicles is called the  
18 Space Enterprise Consortium. It's a consortium where we've  
19 invited and had join about 270 different contractors, small  
20 business, large businesses. About 80 percent of them are  
21 nontraditional -- in other words, commercial -- space  
22 companies. We've been able to utilize that vehicle to do a  
23 lot of prototyping. We have over \$200 million on contract  
24 for 37 different space prototyping efforts, and many of  
25 those -- in fact, most of those -- have a nontraditional

1 component to them. So, we're reaching out to the private  
2 sector, looking for those innovative opportunities, going  
3 into the future.

4 Senator Fischer: Thank you, Senator.

5 General Thompson, I'm going to follow up with a  
6 question I was going to ask you earlier. We'll -- we are  
7 going to do a second round, here.

8 The Air Force has really touted its development of the  
9 next generation of infrared early-warning satellites as an  
10 example of its ability to rapidly acquire space capabilities  
11 in response to those warfighting demands. When announcing  
12 changes to the program last year, the Air Force stated its  
13 intention to cut 4 years off the procurement process. Can  
14 you talk about the progress you've made in meeting that  
15 ambitious goal?

16 General John Thompson: Chairman, relative to the help  
17 that the Congress has provided us, the rapid prototyping  
18 authorities that we receive through Section 804 have been a  
19 godsend. Using those rapid prototypings from Section --  
20 rapid prototyping authorities from Section 804, we were able  
21 to put both layers, if you will, of our Next-Gen OPIR on  
22 contract within 6 months, saving at least a year of time,  
23 from the standpoint of what we'd have had to do if we were  
24 conducting a traditional source selection.

25 The process that we went through was simple, but also

1 rigorous. In other words, we don't want to lose the  
2 oversight in our Section 804 prototyping efforts, similar to  
3 what Ms. Chaplain said earlier. We want to make sure that  
4 the rigor and the robustness of the oversight that we're  
5 providing our contractors is there from the get-go. We also  
6 want to make sure that our board of directors, the Congress,  
7 is kept fully apprised of what we're doing in our Section  
8 804 rapid-prototyping endeavors.

9       On Next-Gen OPIR, we have a quarterly requirement to  
10 come over here. And I will tell you right now, if you want  
11 us to come more often than that, we will. We have triennial  
12 reports that we're submitting on all of our Section 804s,  
13 including Next-Gen OPIR, and our goal, from Dr. Will Roper,  
14 who is the service acquisition executive, is to offer so  
15 much transparency to the Hill on our 804 programs that  
16 you'll actually ask us, "Why are you doing this by the DOD  
17 5000 series? We want some more of that 804 kind of  
18 execution."

19       Senator Fischer: Yeah. Well, I appreciate your  
20 attention to the OPIR. It's an extremely important program,  
21 and I'm happy to see the -- that it's advancing. Do you  
22 believe that the budget that's been presented -- is that  
23 going to support that aggressive schedule that you're --

24       General John Thompson: So, Senator --

25       Senator Fischer: -- on right now?

1           General John Thompson: Chairman, the requirement is,  
2 for 2025, to have an initial launch capability. We  
3 originally envisioned being able to go as fast as 2023.  
4 However, the costs in the budget were just not able to make  
5 us to that gold-medal level. So, we still consider the fact  
6 that we've accelerated the program a little over 2 years, at  
7 this point, and we believe that the '20 budget-and-out fully  
8 supports that. However, there are two above-threshold  
9 reprogrammings that we have been trying to work through the  
10 Department and over here on the Hill, one for FY18 and one  
11 for FY19. Obviously, we missed the President's budget when  
12 -- before we had the requirement to accelerate to 2025. And  
13 so, we're still looking for about \$600 million worth of  
14 above-threshold reprogrammings that we're working very  
15 closely with the Department and the Hill. The FY18 ATR was  
16 approved by the Hill. Thank you for that. But, not all the  
17 sources were. So, we're trying to get the sources in line,  
18 and then a \$400 million above-threshold reprogramming in '19  
19 is still required to meet the '25 need date.

20           Senator Fischer: Okay. Thank you.

21           Ms. Chaplain, I understand that the GAO recently  
22 completed an assessment of the Department's space  
23 acquisition workforce, and see that some of your findings  
24 are described in your testimony. If you could just, in the  
25 remaining time, talk a little bit about the difficulty in

1 tracking and identifying acquisition professionals working  
2 on space programs. This isn't really a clear and distinct  
3 group of people, is it? You kind of referenced that in your  
4 opening remarks.

5 Ms. Chaplain: Right. I think the Department's pretty  
6 good at tracking acquisition professionals in certain lines  
7 of effort, like program management, certain types of  
8 engineering. And what the Department as a whole doesn't do  
9 is track acquisition professionals tied to certain missions,  
10 like space. So, the fact that they couldn't do this for  
11 space isn't unusual. It's sort of an issue across the  
12 Department. But, we believe that maybe we do want to add  
13 some fields to the databases that track people so that we  
14 can help identify who is in space, especially if we're going  
15 to move together some organizations.

16 Also in our review, we came across comments and  
17 concerns about gaps in expertise in certain areas for space,  
18 mostly in the technical things, and trying to keep people on  
19 for long periods of time and get professionals in at the  
20 mid-level. And those are persistent concerns that we've  
21 reported on over the years. I know there's been a lot of  
22 effort to strengthen the workforce, but it's still an issue  
23 for space.

24 Senator Fischer: Okay. Thank you.

25 Senator Heinrich.



1           Senator Heinrich: One of you mentioned space  
2           situational awareness a few minutes ago, and that, in  
3           conjunction with the open-source reporting that Senator King  
4           mentioned about India and their ASAT test today, got me  
5           thinking about -- I think it was 2007 when we went through  
6           the initial Chinese effort at this, that scattered junk all  
7           over low-Earth orbit and made a mess for everyone. Do --  
8           what do we know, at this point -- or, what can you share in  
9           this environment -- any thoughts on the Indian story? But,  
10          more importantly, do we need some sort of international  
11          structure -- a space code of conduct, for example -- to make  
12          sure that, if nations are going to test, they're going to do  
13          it in a way that doesn't create the kind of enormous  
14          problems, which led, in many cases, to the kind of funding  
15          that we have to put into space situational awareness today?

16          General David Thompson: Senator Heinrich, thank you.

17          Senator Heinrich: "DT."

18          General David Thompson: I'd like to, if I can -- I'll  
19          talk to you a little bit about the Indian ASAT test that did  
20          occur this morning. First of all, we were aware that it was  
21          coming, because of some flight bans that India had announced  
22          and some information they had published previously. But,  
23          the launch occurred at 1:39 a.m., Eastern Time. And, first  
24          of all, let me say clearly, it was detected and  
25          characterized and reported by Air Force systems -- missile

1 warning systems and our airmen at Buckley Air Force Base.

2 Senator Heinrich: Right.

3 General David Thompson: Immediately after the test --  
4 it struck the target vehicle -- the Joint Space Operation  
5 Center and the Air Force's 18th Space Control Squadron began  
6 collecting information about the breakup of the vehicle.

7 Senator Heinrich: Yeah.

8 General David Thompson: Currently, they're tracking  
9 about 270 different objects in the debris field. Likely,  
10 that number is going to grow as the debris field spreads out  
11 and we collect more sensor information.

12 Senator Heinrich: Do we know what the elevation of  
13 that debris field was at the breakup?

14 General David Thompson: Senator, we do, but I'm going  
15 to ask to pass that in --

16 Senator Heinrich: Okay.

17 General David Thompson: -- different channels. I'm  
18 not convinced I know that that's an unclassified fact.

19 Senator Heinrich: Okay.

20 General David Thompson: But, we do know the altitude  
21 at which it occurred. And we immediately started providing  
22 public notice on our Space Track website, and will provide  
23 direct notification to satellite operations -- operators if  
24 those satellites are under threat. I will also say, at this  
25 point in time, the International Space Station is not at

1 risk. That's another thing that we do, and provide warning  
2 routinely. But, that's just an example of -- no other  
3 nation, no other military force, no other civil or other  
4 body could have detected, characterized, and begun warning  
5 and providing the world the way we do --

6 Senator Heinrich: Right.

7 General David Thompson: -- with Air Force and other  
8 joint assets. And so, that's -- that represents a  
9 tremendous capability, but we have more investment to turn  
10 that from what I'll call a routine -- matter of routine  
11 spaceflight safety approach to searching and finding and  
12 detecting threats who are attempting --

13 Senator Heinrich: Right.

14 General David Thompson: -- hide us, as well.

15 Senator Heinrich: Do you want to touch on the issue of  
16 whether or not we need to engage in some sort of  
17 multilateral effort to ensure that someone doesn't make the  
18 kind of mistake that China made back in 2007? Do we need  
19 some parameters where people agree to, for example, not test  
20 at very high altitudes?

21 General David Thompson: I would say -- certainly, in a  
22 broad sense. And this will be a specific example. There's  
23 a lot of work to do with the rest of the world on what are  
24 established norms of behavior, rules of engagement, and the  
25 code of conduct in space. And I know that's a matter that

1 the State Department and the Department of Defense and --  
2 led by OSD, is working with the rest of the world. It's  
3 certainly a need that we all need to address.

4 And I'll ask -- I don't know if Mr. Rapuano wants to  
5 add more in that regard, but it's a need.

6 Mr. Rapuano: We are involved with discussions  
7 internationally, and we have participated in a -- nonbinding  
8 confidence-building measures associated with activities in  
9 space. We are certainly proponents of safe and sustainable  
10 space, and minimization of space debris. So, that is an  
11 active an ongoing conversation.

12 Senator Heinrich: Okay.

13 I'm going to -- I'm getting close to the end, here.  
14 And given that I went over earlier, I'm not going to make  
15 that mistake twice. So, thank you --

16 Senator Fischer: Thank you, Senator.

17 Senator Heinrich: -- Madam Chair.

18 Senator Fischer: Senator King.

19 Senator King: I just want to reiterate the point that  
20 Senator Manchin was making. I've been in numerous hearings,  
21 every single CEO, Secretary of State, whoever, is sitting  
22 where you're sitting. You say, "How's your cyber  
23 protection?" "We're good. We're safe." None of them know  
24 that. And so, I want to urge you, if you go to one of your  
25 prime contractors and say, "How's it going?" or if you get a

1 contractual assurance, don't believe it. My suggestion is  
2 Red Teaming them. There's nothing like a skull and  
3 crossbones that appears on the CEO's computer screen that  
4 says, "Congratulations, you've been hacked by the U.S. Air  
5 Force. Your award is the termination of your contract." I  
6 mean, we've got to be aggressive about this, because, to  
7 accept assurances is just -- everybody gives you those  
8 assurances. They don't really know, and they don't know  
9 until they've been tested. And you have the capability of  
10 doing that. The Pentagon has done Bug Bounty programs and  
11 Red Teams. I urge you to do this.

12       This -- the intellectual property theft via  
13 subcontractors, as Senator Manchin was talking about, is the  
14 new frontier. And it just came up this morning in a hearing  
15 with the Navy. And we've had it with Secretaries of State.  
16 We've had it with CEOs of utilities. There were just some  
17 cases -- the Wall Street Journal had a major story about a  
18 third-generation sub for a utility, who, you know, was a  
19 headhunter or something, got up into the control system of  
20 the utility. So, I urge you to not take assurances, but to  
21 be aggressive about this. And I think a Red Team approach  
22 is one that could, maybe, put the fear in them.

23       Thank you.

24       Thank you, Madam Chair.

25       Senator Fischer: Thank you, Senator King.

1           I'd like thank my colleagues for their attendance and  
2 their good questions today, thank the panel for the  
3 information you've provided. If members do have questions,  
4 I hope that you will respond in writing and be able to get  
5 those to us in a timely manner.

6           With that, the hearing is adjourned.

7           [Whereupon, at 3:47 p.m., the hearing was adjourned.]

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