

Stenographic Transcript
Before the

Subcommittee on Strategic Forces

COMMITTEE ON
ARMED SERVICES

UNITED STATES SENATE

MILITARY SPACE ORGANIZATION, POLICY, AND PROGRAMS

Wednesday, May 17, 2017

Washington, D.C.

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MILITARY SPACE ORGANIZATION, POLICY, AND PROGRAMS

Wednesday, May 17, 2017

U.S. Senate
Subcommittee on Strategic
Forces
Committee on Armed Services
Washington, D.C.

The subcommittee met, pursuant to notice, at 2:00 p.m.
in Room SR-222, Russell Senate Office Building, Hon. Deb
Fischer, chairman of the subcommittee, presiding.

Present: Senators Fischer [presiding], Cotton,
Sullivan, Cruz, Rounds, Donnelly, Heinrich, Warren, and
Peters.

1 OPENING STATEMENT OF HON. DEB FISCHER, U.S. SENATOR
2 FROM NEBRASKA

3 Senator Fischer: Good afternoon and welcome. The
4 hearing will come to order.

5 The committee meets today to receive testimony on space
6 organization, policy, and programs. I would like to thank
7 the very distinguished panel of witnesses for agreeing to
8 testify before us today.

9 Space-based capabilities are integral to the way our
10 military operates and our society functions. As previous
11 hearings in this subcommittee have documented, our
12 adversaries are developing increasingly sophisticated ways
13 to attack U.S. space assets and exploit the domain for their
14 own purposes.

15 General Hyten, General Raymond's predecessor and the
16 current STRATCOM Commander, told us just last month that
17 space is a warfighting domain just like air, ground,
18 maritime, and cyber, and we must normalize how we plan and
19 operate in space.

20 This new environment requires a flexible and an
21 innovative military space enterprise capable of overcoming
22 an ever-changing threat picture and rapidly delivering
23 capabilities to the warfighter. However, the work of
24 numerous reviews and commissions suggests there is a deep
25 gap between the space enterprise that we need and the one

1 that we have.

2 For example, the Rumsfeld commission concluded in 2001
3 that the Department of Defense is not yet arranged or
4 focused to meet the National Security Space needs of the
5 21st century. More recently, a study by the GAO directed by
6 this subcommittee in 2015 concluded that DOD space
7 leadership responsibilities are fragmented and spread across
8 approximately 60 stakeholder organizations from DOD to the
9 Executive Office of the President to the intelligence
10 community and civilian agencies. Eight of the 60
11 stakeholders have acquisition responsibilities, 11 are
12 responsible for oversight, and six are involved in setting
13 requirements for defense space programs.

14 I question whether such an arrangement can meet the
15 Nation's needs in space, and I look forward to hearing our
16 witnesses' views on how the current architecture can be
17 improved.

18 As we examine the organizational structure of the space
19 enterprise, it is equally important that we ensure it
20 receives the necessary personnel and resources. A recent
21 study by the Department of Defense Office of Cost Assessment
22 and Program Evaluation, or CAPE, noted that funding for
23 space procurement and research and development are both at
24 or near 30-year lows.

25 Additionally, my colleague on the House Armed Services

1 Committee, Congressman Rogers, has noted that out of the 37
2 nominees in March on the Air Force promotion list, from
3 colonels to one-star generals, none of the nominees were
4 career space professionals, like General Hyten, General
5 Raymond, and Lieutenant General Greaves were at that point
6 in their career. Both of these statements call into
7 question whether the department is appropriately
8 prioritizing space.

9 Let me again thank the witnesses for their service and
10 for testifying today.

11 I now recognize the ranking member, Senator Donnelly,
12 for any opening remarks he would like to make.

13 Senator Donnelly?
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1 STATEMENT OF HON. JOE DONNELLY, U.S. SENATOR FROM
2 INDIANA

3 Senator Donnelly: Thank you, Madam Chair.

4 I want to start by thanking all of our witnesses for
5 being here today, and thanking you for calling this hearing
6 on such an important subject.

7 Secretary Wilson and General Goldfein, your presence
8 here today sends a powerful message on the importance of
9 these issues to our national security. Thanks for joining
10 us and for your leadership on defense space issues.

11 General Raymond, this is your first time before the
12 committee, and I welcome and look forward to your input.

13 And, General Greaves, I understand that this will be
14 your last appearance as director of the Space and Missile
15 System Center. Let me thank you for your service and
16 leadership. I know you will miss us immensely over here at
17 the hearing rooms. You will soon lead the Missile Defense
18 Agency, so we will be seeing more of you before the
19 subcommittee.

20 Ms. Chaplain, as always, you and your team are critical
21 to the work of the subcommittee. We rely heavily on you,
22 and we are thankful for the advice you give us on space
23 issues. It is critically important.

24 Today's hearing will focus on two issues. How can the
25 Air Force and the department improve the way we conduct

1 space missions? And how can we acquire space systems
2 rapidly to meet mission requirements?

3 Freedom of navigation in space cannot be taken for
4 granted these days. Any conflict on the ground will quickly
5 spread to space, and today's space systems are fragile.

6 Prior thinking on how we perform our space mission
7 needs to change and quickly, as General Hyten noted. Our
8 disconnected operations, acquisition efforts, and resourcing
9 hamper us today both in Air Force and DOD as a whole. I
10 hope we can change that sooner rather than later.

11 I look forward to your views today in helping this
12 subcommittee address these pressing issues.

13 Thank you.

14 Senator Fischer: Thank you, Senator Donnelly.

15 We will now turn to our witnesses for their opening
16 statements, and your full remarks will be put into the
17 record.

18 I would like to welcome Secretary Wilson. This is your
19 first official hearing, and we appreciate you being here
20 today. Welcome.

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1 STATEMENT OF HON. HEATHER A. WILSON, SECRETARY OF THE
2 AIR FORCE, ACCOMPANIED BY GENERAL DAVID L. GOLDFEIN, USAF,
3 CHIEF OF STAFF OF THE AIR FORCE; GENERAL JOHN W. RAYMOND,
4 USAF, COMMANDER, AIR FORCE SPACE COMMAND; LIEUTENANT GENERAL
5 SAMUEL A. GREAVES, USAF, COMMANDER, SPACE AND MISSILE
6 SYSTEMS CENTER, AIR FORCE SPACE COMMAND; CRISTINA T.
7 CHAPLAIN, DIRECTOR OF ACQUISITION AND SOURCING MANAGEMENT,
8 GOVERNMENT ACCOUNTABILITY OFFICE

9 Ms. Wilson: Thank you, Madam Chairman, and thank you
10 for putting our statement in the record. General Goldfein
11 and I will highlight a few key points, and then we look
12 forward to taking your questions.

13 It is obvious but it is probably worth repeating that
14 the U.S. is heavily dependent upon space, and our
15 adversaries know it, and they know it is a vulnerability.
16 In any conflict, space will be contested.

17 We have not always assumed that in the past, and so
18 there is really underway, and has been for some time now,
19 certainly since 2007, a change in culture, a change in
20 planning and training going on in the United States military
21 because we cannot take space dominance for granted.

22 The second major thing is that since this is now less
23 than 24 hours since I was sworn into office, but over the
24 last week since the United States Senate voted on my
25 confirmation, I have been rolling up my sleeves pretty

1 seriously every day and getting reacquainted with the space
2 programs, which I had not been read into since serving on
3 the Intelligence Committee in the House.

4 While there is a lot more to do, I will tell you that I
5 have been initially pleased by some of the things I see on
6 what the Air Force is doing to improve training, to identify
7 gaps, to experiment with new concepts of operations,
8 particularly in the last 18 to 24 months. There is a great
9 deal that is going on with respect to addressing the needs
10 of the Nation to be able to prevail in space. So I think
11 you should know that from me, coming back into the national
12 security business.

13 With respect to acquisition, we also have a lot of
14 equipment and services that are going to be bought for space
15 in the next few years. It is a very heavy agenda, a very
16 heavy menu that we are going to have to go through.

17 And I wanted to personally thank you for giving
18 authority back to the Air Force for acquisition, because we
19 do need to clean these things up. I think it is going to
20 help, and we are working in the Department of Defense to
21 implement the changes which you authorized, so we can get
22 the capabilities that we need on time and on budget.

23 Those changes are not yet fully implemented, and it is
24 one of the priorities with respect to organizing the mission
25 in the Air Force and getting those things done.

1 Finally, timing is not exactly ideal for this hearing
2 in the sense that the full budget rollout will be next week,
3 but I expect an increase in space expenditure from fiscal
4 year 2017, and what we cannot accommodate will, of course,
5 appear on the unfunded priorities list.

6 One of the great things about being a new Secretary
7 with an interest in space is that it is a team that gets
8 things done. I am pleased to be here today with an
9 exceptional team of leaders in space, and that starts out
10 with an exceptional chief of staff, and I turn it over to
11 General Goldfein.

12 [The prepared statement of Ms. Wilson follows:]

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1 Senator Fischer: Thank you, Madam Secretary.

2 General?

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1 STATEMENT OF GENERAL DAVID L. GOLDFEIN, USAF, CHIEF OF
2 STAFF OF THE AIR FORCE

3 General Goldfein: Thanks, Chairwoman Fischer and
4 Ranking Member Donnelly. Thanks for holding this important
5 and timely hearing.

6 I cannot tell you what an honor it is to sit here with
7 Dr. Wilson, our 24th Secretary of the Air Force, 24 hours
8 after she was sworn in. I will just tell you that she gives
9 new meaning to one of my favorite quotes: The fight is on.

10 Along with General Raymond and Lieutenant General
11 Greaves, we really appreciate you holding this hearing.

12 As the air component commander in Central Command some
13 years ago, one of my assigned missions from the combatant
14 commander, who at the time as General Jim Mattis, was to be
15 his space coordinating authority.

16 It was my responsibility to first understand his space
17 requirements and those of my fellow component commanders
18 from the Navy, the Army, the Marines, the SOF, the Coast
19 Guard, and our interagency and allied partners across the
20 region and to ensure their mission needs were being covered
21 by capabilities provided by 14th Air Force and U.S.
22 Strategic Command. It was a natural fit because I had the
23 only headquarters in the region with the ability to
24 coordinate space activity in support of combatant command
25 and commander operations.

1 Today's air component commanders in all of our COCOMs
2 are performing this space coordinating authority duty from
3 their air and space operations centers. So it is this
4 experience employing space capabilities in combat that
5 frames how I see my responsibilities today first as a member
6 of the Joint Chiefs and also as a service chief.

7 As a joint chief, I have a responsibility to work with
8 the chairman, my fellow joint chiefs, and our interagency
9 partners to understand their requirements and ensure they
10 are appropriately represented in all space activities. As
11 the service chief with responsibility for over 90 percent of
12 the space enterprise, I have an obligation to work with
13 Secretary Wilson to organize, train, equip, and present
14 ready forces to the combatant commander, General John Hyten,
15 so he can fight should a war either start or extend into
16 space.

17 Space superiority, like air superiority, is not an
18 American birthright. It requires vigilance and action. We
19 have many more steps ahead of us, but America's airmen
20 remain committed to evolving our space organization,
21 strategy, requirements, architecture, and forces to adapt to
22 the new reality that you laid out and ensure we gain and
23 maintain air and space superiority.

24 As Secretary Wilson has stated, we have accomplished a
25 great deal in the last few years. The Air Force has

1 streamlined decision-making for the space enterprise. We
2 are normalizing, integrating, and elevating space, building
3 on over 60 years of space operations experience. However,
4 there is much more work to be done, and we look forward to
5 working with this committee and our interagency partners to
6 strengthen our competitive advantage in this critical
7 domain.

8 Our legacy includes Benny Schriever, the father of Air
9 Force Space; Thomas White, our fourth Chief of Staff; Jerome
10 O'Malley, the leader most responsible for Space Command; Tom
11 Moorman; Kevin Chilton; Bob Kehler; Susan Helms; John Hyten
12 -- all space giants. This has been our business since 1954.
13 We will own the high ground.

14 Thank you again for holding this hearing, and I look
15 forward to your questions.

16 [The prepared statement of General Goldfein follows:]

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1 Senator Fischer: Before we begin, General, I would
2 like to thank you for your recent column on our nuclear
3 modernization. It was needed, and it is something that
4 Senator Donnelly and I believe is very, very important. So
5 thank you for putting that out.

6 We will begin the first round of questioning, please.
7 I would address this to the entire panel.

8 How do each of you characterize the problems that we
9 face with the organization of the National Security Space
10 enterprise?

11 Madam Secretary, why don't you begin?

12 Ms. Wilson: Madam Chairman, as the Secretary of the
13 Air Force, I am the principal adviser to the Secretary of
14 Defense with respect with respect to space. I take that
15 obligation very seriously.

16 There are some recommendations that the staff has been
17 working on with respect to how to organize within the Air
18 Force on space. There actually has been quite a bit of
19 staff work done to make sure we are structured properly. I
20 want to make sure that I review that well and get this right
21 without signing something on day one. But I think there is
22 a review underway of organization.

23 In general, I think the Air Force has been doing this
24 for 60 years, and that 80 percent of what the Defense
25 Department does in space is the United States Air Force. So

1 we take the mission as a core mission.

2 Senator Fischer: Thank you.

3 General?

4 General Goldfein: Ma'am, I would say that, right now,
5 we are in a strategic shift from treating space as a benign
6 domain from which we monitor, sense, and report into a
7 warfighting domain from which we fight should a war start in
8 space or extend into space.

9 So where we are focused as a service and as the
10 department is in four key areas that we are looking at. All
11 of them are linked when you look at the enterprise as we go
12 forward.

13 The first element we are focused on is how we ensure
14 that we have good, solid strategy and policy that we get
15 that we then as a service can act upon and we as joint
16 chiefs can act upon. From good strategy and policy, how
17 does that actually then derive into a concept of operations
18 a warfighting ConOps, if you will, that is written in the
19 business of joint warfighting that is not unique and
20 different because it is space, but it is actually integrated
21 and normalized because we actually know how to fight in all
22 of these domains.

23 From that ConOps derives solid requirements. With
24 those requirements, we then have to acquire a pace that will
25 allow us to be faster than our adversaries who are all

1 investing in ways of taking away our advantage.

2 The final element that we are focused on is how we
3 organize, train, equip, and present ready forces to the
4 combatant commander so that that combatant commander,
5 General John Hyten in this case, can fight should a war
6 extend into space.

7 So this is about looking at each of those elements,
8 looking at the entire space enterprise, and looking at how
9 we move it forward in an integrated way as we shift to a
10 warfighting domain.

11 Senator Fischer: Thank you.

12 General Raymond?

13 General Raymond: Thank you. I would just add that I
14 agree with the framework that General Goldfein laid out.

15 I think, operationally, we are very sound. We are the
16 best space force, and that should not be lost on anybody. I
17 do think, though, with what we see with the domain becoming
18 a contested domain, we have to have the ability to move
19 fast. That is where my focus has been, to make sure that we
20 have both the operational policies, processes, and
21 procedures and the acquisition capabilities to move fast.

22 Senator Fischer: Thank you.

23 Ms. Chaplain?

24 Ms. Chaplain: Yes, as you know, I look at things from
25 an acquisition perspective, so I might have a different

1 point of view. But for acquisition, that is all about
2 staying ahead of the curve, being agile, and being as fast
3 as you can to delivery.

4 In that regard, we do see a lot of organizational
5 challenges that need to be addressed. There is
6 fragmentation in leadership for space acquisitions, no clear
7 point of accountability or authority when it comes to very
8 complex efforts like the GPS system. You have the military
9 services involved. You have the Air Force involved in
10 delivering a satellite. You have ground systems.

11 It is an extremely complex situation where you need a
12 clear line of authority to prioritize systems, lay out clear
13 plans, and we do not have that yet. As a result, you have
14 pretty big gaps between the delivery of satellites and the
15 delivery to ground. You essentially waste capability in
16 space when you do that, so the fragmentation is a big issue
17 in terms of our ability to stay ahead of the curve.

18 Within that structure, we often hear that there are too
19 many people down the acquisition line who can say no and
20 that the process is not streamlined enough. Some of those
21 issues are common to all weapons systems, but they are very
22 particularly evident in space because you actually have more
23 players involved in a space system and more players involved
24 in the acquisition process.

25 Senator Fischer: Thank you.

1 General Greaves?

2 General Greaves: Madam Chairwoman, in addition to what
3 Secretary Wilson and Chief of Staff Goldfein and General
4 Raymond commented on, I would only like to add that our
5 decision-making process is what we are currently addressing
6 to ensure that we can streamline it and make decisions
7 affecting the acquisition timeline in a quicker manner.

8 Thank you.

9 Senator Fischer: I would put this question out to any
10 of you who would like to respond. Do you feel that there
11 are criticisms that are being made on the structure that you
12 think are unjustified?

13 General Goldfein?

14 General Goldfein: Ma'am, I would not say that they are
15 unjustified. I will tell you this, that right now, as we
16 make this transition from a benign to a warfighting
17 environment, I would just offer to you that any move that
18 actually ends up separating space as opposed to integrating
19 space I would argue is a move in the wrong direction,
20 because if I was the Chief of Naval Operations, the Chief of
21 Staff of the Army and my fellow joint chiefs and I were
22 sitting here, I would tell you for all of the missions that
23 we as joint chiefs do in the business of combined arms
24 against an enemy, space is absolutely essential to every one
25 of our missions.

1 So the last thing we want to do is actually separate
2 space into something unique and different with its own
3 unique lexicon. Right now, where we are focused is how you
4 further integrate it and how you take the tried-and-true
5 methods of joint warfighting, apply them to the space
6 domain, and ensure that it is normalized across all of these
7 mission sets.

8 So it is not really that it is an unjustified
9 criticism. I just want to make sure that we are moving the
10 Nation in the right direction, which is to integrate space.

11 Senator Fischer: And do any of you feel that there
12 have been any issues in prior studies, like the Rumsfeld
13 commission, that may have been missed, overlooked, left out?

14 Madam Secretary?

15 Ms. Wilson: Madam Chairman, some of the
16 recommendations for action in these different reports are
17 actually contrary to each other. The structure of
18 acquisition and operations that currently exist with space
19 was a recommendation of the Rumsfeld commission, which was
20 then implemented. Some of the other recommendations are not
21 consensus recommendations.

22 So these are controversial and difficult issues. I do
23 not think we should shy away from that. We should analyze
24 them clearly and try to look at what the enterprise needs
25 now and structure in order to achieve that.

1 I think General Goldfein is right. We need to make
2 sure that space is fully integrated and rapidly available.

3 Think about this, what happened last weekend. This
4 country had between 5 minutes and 8 minutes to identify and
5 characterize a launch from North Korea and then decide what
6 to do about it. That has to be integrated, and we have to
7 do this along the lines we have done joint warfighting since
8 Goldwater-Nichols.

9 Senator Fischer: Thank you very much.

10 Senator Donnelly?

11 Senator Donnelly: Thank you, Madam Chair.

12 Secretary Wilson, Air Force Space Command is
13 responsible for training and equipping our airmen to perform
14 the Air Force's space mission, but the command does not have
15 authority for setting requirements and overseeing
16 acquisition related to their mission. Is that a problem?

17 Ms. Wilson: Senator, I do not think the current
18 structure is a problem. It is a result of one of the
19 recommendations of the Rumsfeld commission that was
20 implemented in the Air Force.

21 That said, you constantly review organizational
22 structures based on the needs at the time. Perhaps General
23 Greaves or General Raymond might have something to add to
24 that.

25 Senator Donnelly: Great.

1 General Greaves: Senator, I would add that having the
2 acquisition element within Air Force Space Command is a
3 great advantage, and having my position report directly to
4 the four-star Air Force Space Command is a great advantage,
5 because by working for him, the requirements that are
6 generated at Air Force Space Command immediately flow down
7 to the Space and Missile Systems Center, which we then work
8 with the command to turn into contracts to produce
9 capability while working with Headquarters Air Force, so I
10 see that as an advantage.

11 Senator Donnelly: Okay.

12 General Raymond: I would pile on. I do have
13 requirements, responsibility on the requirements officer, if
14 you will, for Air Force Space Command, and working through
15 the Chief is the Air Force requirements officer. I provide
16 General Greaves with those requirements. I provide him with
17 resources. I provide him with manpower. And I have a
18 pretty strong voice in that chain.

19 Although I am not in the acquisition chain or machine,
20 if you will, I influence that pretty significantly and have
21 been able to do so on several big programs over the first 7
22 months of my time in command.

23 Senator Donnelly: Okay. Thank you.

24 General Goldfein, some space advocates these days are
25 calling for space corps, something like the structure of the

1 Marines within the Navy. Do you support that or do you
2 think we should take a pass?

3 General Goldfein: Sir, I do not support it at this
4 time in our history based on where we are in this transition
5 from a benign environment to a warfighting domain.

6 I will tell you that my sense is that we have an
7 opportunity being placed in front of us right now to take a
8 look at what is the way we fight in the air, on land, at
9 sea, and we know how to do this business, and how we take
10 those processes, procedures, tactics, techniques, and
11 actually apply them across the space domain. So right now,
12 to get focused on a large organizational change would
13 actually slow us down right now.

14 Whether there is a time in our future when we want to
15 take a look at this again, I would say that we probably
16 ought to keep that dialogue open. But right now, I think it
17 would actually move us in the wrong direction and slow us
18 down from where we need to go.

19 Senator Donnelly: General Greaves, one of the lesser-
20 known space missions for the Air Force is providing unique
21 weather data for military needs. For the past several
22 years, this committee has expressed concerns about the Air
23 Force's impending gaps in EOIR sensing data for cloud cover
24 and theater weather imagery, particularly over the CENTCOM
25 area of responsibility in the Indian Ocean.

1 The plan seems to change every year. What is it
2 currently?

3 General Greaves: Thank you, Senator. As part of the
4 acquisition responsibilities at SMC, we have a range of
5 authorities that we can draw on. We have listened to the
6 feedback from the Congress. Working with General Hyten at
7 STRATCOM, we have developed a plan to use one of the
8 authorities that fall under SMC, operationally responsive
9 space, ORS, to use those authorities to speed the delivery
10 of an interim capability to address gaps one and two,
11 theater weather imagery and cloud cover. That is in the
12 works as we speak.

13 Senator Donnelly: It is my understanding that the
14 available GOES assets are aging, and that they will provide
15 a short-term solution right now to the problem. Do Air
16 Force acquisition plans include a longer term solution to
17 meet CENTCOM's needs, something along the lines of 10 to 15
18 years or more?

19 General Greaves: That is correct.

20 Senator Donnelly: Okay. Thank you.

21 Ms. Chaplain, what have your findings been on the Air
22 Force's long-term weather acquisition plan?

23 Ms. Chaplain: Weather is actually a good illustration
24 of some of these problems we talk about with fragmentation.
25 They have been very slow to actually study what is ahead for

1 weather. Some of that study process was hampered by the
2 lack of coordination with agencies, principally NOAA. That
3 led to an incorrect assumption about the availability of
4 European satellites. It slowed the study process down
5 further. So we have 2 to 3 years of study before we can
6 even start a new program. There is still a lot of
7 uncertainty ahead.

8 That is where we are at. We are just waiting to see
9 what they do. The decision-making process has been very
10 slow.

11 Senator Donnelly: General Raymond, do you believe
12 Space Command should become a functional component of the
13 U.S. Strategic Command so that the Air Force Space mission
14 is part of the warfighting responsibility of STRATCOM?

15 General Raymond: I absolutely do. That is part of a
16 larger command and control restructure at STRATCOM.

17 I served previously at STRATCOM. General Hyten is the
18 STRATCOM commander. Today, he has about 18 different
19 component commands, ranging from an O-6 to a four-star
20 general. This is going to streamline that. It is going to
21 elevate the operational commander from a three-star for
22 space, from a three-star to four-star, align that with me,
23 align the service component responsibilities with the forces
24 component responsibilities, strengthens my voice in joint
25 requirements, and I am fully supportive.

1 Senator Donnelly: Thank you.

2 Thank you, Madam Chair.

3 Senator Fischer: Thank you, Senator.

4 Senator Rounds?

5 Senator Rounds: Thank you, Madam Chair.

6 First of all, thank you all for your service to our
7 country.

8 Secretary Wilson, welcome aboard. It is great to see
9 you at our first hearing. This is special.

10 I have a couple questions. First of all, I agree,
11 General Goldfein, that, clearly, we will have basically a
12 contested domain in space. I am just curious, the GPS, Next
13 Generation Operational Control System is an item I think --
14 or at least the GPS system we have today is clearly at risk
15 and would be an item to be targeted by any of our
16 adversaries.

17 Thinking of GPS and other data-gathering or
18 transmission systems that are in space today, we use them
19 almost like infrastructure today. If someone attacks or
20 could attack, and we talk about this being basically an area
21 where we could fight a war, clearly, we have individual
22 nations in mind. Who are our closest adversaries with
23 regard to having a battleground in space?

24 General Goldfein: So right now, in terms of who we are
25 watching and what their investment is, clearly, those who

1 are furthest ahead are China and Russia. So they have been
2 watching since Desert Storm. They have seen how we use
3 capabilities from space. They have studied our reliance on
4 space. They are clearly investing in ways to take away that
5 advantage.

6 Beyond that, Senator, I would love to get on your
7 schedule to give you a classified briefing on a little bit
8 more detail of what we are seeing.

9 Senator Rounds: I think why I ask it now is because it
10 has to be made very clear that we have resources in space
11 that what they would try to deny us. One of the reasons we
12 have talked about it is that we are in the process, in fact,
13 in a very challenging process, with the GPS Next Generation
14 Operational Control System. It is probably, as suggested by
15 GAO, perhaps the most problematic Air Force program that we
16 have.

17 A little over a year ago, General Greaves called it the
18 number one troubled program within the Department of
19 Defense. The program is nearly \$2 billion over budget, and
20 at least 4 years behind schedule. In October 2016, the
21 department completed a Nunn-McCurdy review and certified to
22 Congress that the OCX was essential to national security,
23 which I think you are reinforcing here today, no alternative
24 would provide acceptable capability at less cost, and that
25 program's revised cost estimates were reasonable.

1 I understand that the assessment from the most recent
2 government review is that the program is making acceptable
3 progress, but it is by no means out of the woods.

4 Is the OCX program too big to fail?

5 General Goldfein: Sir, if I could, because you have
6 raised some great issues here about space resiliency, if I
7 could take a minute and talk about just basic defense of our
8 systems, and then turn it over to General Raymond and
9 General Greaves on the specifics associated with GPS and
10 OCX.

11 We actually as a service know how to do layered defense
12 of critical infrastructure. If you were to walk to Bagram
13 Air Force Base today, you would see a commander who can walk
14 into a headquarters and have situational awareness on things
15 that are going on out to 100 miles from that base and
16 various layered defenses that we put in place all the way up
17 to, at the wire, and inside the wire.

18 That is the same mindset that we have to apply toward
19 layered defense of our critical space systems. That is
20 where we are moving now, to look at not only that layering
21 but at also how we build resiliency and, perhaps as
22 important, how we ensure that we train this force so that if
23 a portion of that enterprise is denied or taken away, we can
24 still fight and operate, and we do that every day. So this
25 is about resiliency in the overall space architecture.

1 Finally, I would say that you captured this right, in
2 that as you look at any space constellation, there are three
3 elements that we have to look at how we defend in a layered
4 way. First of all is what is actually in space and what
5 orbit we have to defend. Then you have to look at what has
6 been integrated on various platforms that use that
7 information -- some that fly, some that run, some that
8 steam, some that submerge. Then you have to look at the
9 ground control stations that receive that data, and all of
10 those have vulnerabilities that we have to protect.

11 Senator Rounds: So it is fair to say that it is too
12 big to fail?

13 General Raymond: I would say no program is too big to
14 fail. I would tell you the mission is too big to fail. The
15 importance of being able to access GPS III, and the
16 resiliency that that provides, is too big to fail.

17 We have programmatically built off-ramps to be able to
18 go a different direction, if this were not to continue to
19 progress. I will not be comfortable until that capability
20 is operational on an ops floor. But it is a very important
21 mission, and I will tell you we are laser-focused on it to
22 make sure that it materializes and then have alternative
23 paths if not. And General Greaves can talk to you more
24 about those alternative paths.

25 General Greaves: Yes, Senator, this program is

1 absolutely not too big to fail. In fact, when we looked at
2 it as a department within the Department of Defense late
3 2014, early 2015, we understood that this GPS III
4 operational control ground segment was the first information
5 assured, really hardened capability that we were going to
6 deploy to protect against both the outside and inside
7 threats. So we knew that.

8 We also knew that as we looked at the criticality of
9 this system, we needed to build off-ramps. General Raymond
10 mentioned some of those. We had milestone-driven off-ramps.
11 So we looked at whether or not, if the system was delayed or
12 we had to cancel the program, whether or not we would have
13 control over the new GPS satellites. So we entered into a
14 contract with industry to develop a contingency ops
15 capability, which will allow us to fly the GPS III
16 satellites as legacy satellites. So that was one milestone
17 that we made a decision on.

18 We also had a decision to make on whether or not the
19 block zero of OCX, which is used to launch and check out the
20 satellites initially, whether or not that would remain on
21 track. That has remained on track. It is going through
22 final testing now, and it is going to be ready to support
23 the first launch next year.

24 We also looked at our military code, whether or not the
25 delays in OCX would impact the deployment of M-code. We

1 also let a contract to start that effort to ensure that
2 would be in place.

3 Senator Rounds: If I could, I do not mean to cut you
4 off, I am going to run out of time and I want to be careful
5 of that.

6 I think the critical part here is that we have a GPS
7 system, which we rely on today, which I believe you would
8 say is at risk. What we are trying to do is find a way to
9 protect it. This is one of those tools that is necessary in
10 order to create our ability to respond and fight the war
11 that we have become used to over the last 25 to 30 years.
12 Fair enough?

13 General Greaves: Yes, sir.

14 Ms. Wilson: Senator, fair enough. And we are not out
15 of the woods on OCX yet, which is one of the reasons why
16 there is a quarterly review at the Secretary of Air Force
17 level to make sure that this program stays back on track, so
18 it has a very high level of visibility of oversight within
19 the Air Force to get it to his ops floor.

20 Senator Rounds: Thank you.

21 Thank you, Madam Chair.

22 Senator Fischer: Thank you, Senator.

23 Senator Peters?

24 Senator Peters: Thank you, Madam Chair.

25 Thank you to each of our panelists for being here

1 today.

2 I will join my colleagues in congratulating Secretary
3 Wilson on her appointment. We look forward to working with
4 you. It is great to have you here. I will extend once
5 again the invitation that I extended to you when I had the
6 opportunity to meet with you in my office, to come to
7 Michigan to Selfridge Air National Guard Base, in
8 particular, given the fact your father served at Selfridge.
9 We would love to have you back.

10 Just to put it out there, they are celebrating their
11 100th anniversary this August, so we will talk to your
12 scheduler about a visit, which would be really wonderful.
13 And I am proud to say the Air Force Thunderbirds will be
14 performing that day as well. So hopefully, you can be
15 there.

16 I want to talk a little bit about some other threats
17 that we face from space, in addition to some of the military
18 threats we have talked about. That deals with space
19 weather. We have heard about weather forecasting on Earth,
20 but threats that come from space, from the sun particularly,
21 solar flares and potentially mass coronal ejections that can
22 have a devastating impact on the Earth.

23 The Senate unanimously passed legislation that I worked
24 on with my colleague Senator Gardner in a bipartisan way to
25 coordinate the various agencies that have oversight of this

1 potential problem from NOAA to NASA, to the Science
2 Foundation, the Department of Defense, and FAA. This has a
3 big impact from the Department of Defense perspective for
4 situational awareness as well as mission planning. And we
5 know that it is just a matter of time before a very big
6 storm occurs. I am happy to say the University of Michigan
7 is one of the leading institutions studying heliophysics and
8 the potential threat that this has.

9 Whoever would like to comment about the importance to
10 the Air Force of having some accurate space weather
11 forecast, where do you see us in that regard? Are you
12 concerned?

13 I have been told that our space weather forecasting
14 ability is equivalent to our hurricane forecasting ability
15 in the 1930s, which was not that good in 1930. If it is
16 that way for us here today, particularly given the
17 interconnectedness that we have and the fact that the
18 electrical grid could be wiped out through a large part of
19 the United States should the storm hit, what should we be
20 thinking about? And does the Air Force have the resources
21 that you need? And should we be thinking about adding to
22 those, if not?

23 General Raymond: First of all, I would just say thanks
24 for the question.

25 Space weather is very important to our operations, both

1 in space and in the air and all the domains. We take this
2 very seriously.

3 I would have a slightly different characterization of
4 where we are in relation to hurricanes in 1930s. We have
5 space weather experts in our Air Force that sit right on the
6 ops floor that we operate. They provide us very timely
7 information on space. We provide that warning across our
8 forces.

9 When I was deployed, and General Goldfein talked about
10 when he was at SEAFAC, when I was deployed as the director
11 of Space Forces, we had space weather folks there as well
12 that could help us shape operations to be able to operate
13 and continue operations in that environment.

14 As you know, space weather goes through cyclical
15 periods. The current period that we are in now is not all
16 that high. But as you said, there will be periods where we
17 will get increased solar activity.

18 General Greaves: Senator, let me add that the Air
19 Force is very serious about this. We have been directed,
20 for every new space system that we are deploying, to have
21 energized charged particle sensors on board to help
22 characterize the environment that those spacecraft will fly,
23 which will then help with the modeling that we have to do on
24 the ground to do predictions.

25 Senator Peters: Thank you. I will look forward to

1 continuing to work with you. I think the forecasting, the
2 analogy to hurricane forecast is a very large impact like we
3 had back in 1859. Folks at the University of Michigan and
4 others have talked about that catastrophic impact.

5 Lloyd's of London has made a risk assessment that, if a
6 storm of that magnitude hits, it would be over a \$2 trillion
7 impact to the U.S. economy. Apparently, we missed one by
8 just a few days just a few years ago. So that is the area
9 where we are concerned about and why this legislation has
10 been moving forward, to work with you on that.

11 General Raymond: I totally agree with the criticality
12 of being able to do that right.

13 Senator Peters: Thank you.

14 The other thing, and, General Goldfein, you talked
15 about how the domain that we are dealing with now is
16 different from what we thought about it in the past. This
17 is a contested domain that we have to harden our satellites.
18 We have to harden our assets that the Air Force has.

19 The question came up from Senator Rounds and others
20 about the GPS system. But that leads to a broader question.
21 We have an awful lot of commercial satellites in space as
22 well that are critical infrastructure. Those would be
23 considered particularly soft targets, I would expect, that
24 an adversary could target.

25 How do you think about hardening our space systems, not

1 just from the DOD assets but understanding that significant
2 civilian assets also could potentially pose a real threat to
3 our country, if they are targeted?

4 General Goldfein: Yes, sir. I think the first
5 important step is to make sure that we acknowledge that this
6 is truly a partnership and that there are those who are
7 operating in space beyond the traditional state actors that
8 we were growing up with perhaps earlier in our careers, and
9 especially as commercial gets more and more interest in
10 space and is launching more of the smaller satellites. When
11 we talk about it being more of a contested and congested
12 place, that is probably what contributes as much as anything
13 to it being more congested as we operate.

14 And there is a question of whether it is more challenge
15 or opportunity. I would offer to you that as we see space,
16 as we see commercial entities getting more and more in the
17 space business, there are probably more opportunities than
18 challenges as we work with them in public-private
19 partnerships looking at potential for other launch
20 capabilities, looking for the smaller digitization of
21 satellites that allow us to actually get capability,
22 actually leveraging what they are doing commercially that
23 could actually contribute to military operations.

24 All of those things are ongoing. As the Chief of Staff
25 of the Air Force, and as a joint chief, I look at the

1 public-private partnership opportunities ahead as we go
2 forward, in terms of continuing to normalize how we operate.

3 Senator Peters: If I may pick up on the comment that
4 you made regarding crowded space, the crowded place up there
5 with all the satellites, my understanding is that India
6 recently launched 104 satellites from one rocket -- 101 of
7 them were smaller nanosatellites, including 96 from various
8 U.S. companies and commercial enterprises.

9 I understand it took a significant amount of time to
10 track and find these objects, to keep track of them. That
11 leaves the question of space debris, all sorts of things
12 that are happening.

13 Could you give me a sense of where we are in dealing
14 with that issue? The Air Force I know has taken primary
15 responsibility in tracking a lot of these objects. Should
16 we continue to do that? Is there something else we should
17 be thinking about? Because this will likely accelerate in
18 the years ahead.

19 General Raymond: That is another great question.

20 Space is clearly a congested domain. We track about
21 23,000 objects each and every day, 24/7. We take about
22 400,000 observations a day to keep track of that. About
23 1,400 of those objects are satellites. About 75 percent of
24 those are maneuverable.

25 This is a CubeSat. You talked about the 109 that were

1 launched on the one rocket from India. We are seeing trends
2 of smaller satellites. This satellite goes 17,500 miles an
3 hour in orbit.

4 We work very hard to be that space traffic control, if
5 you will, to keep the domain safe for all.

6 On average, about once every 3 days, a satellite
7 repositions to keep from hitting either a piece of debris or
8 another satellite. On average, about three times a year,
9 the International Space Station maneuvers to keep from
10 hitting a piece of debris. It is something we take very,
11 very seriously.

12 I will tell you the airmen and joint forces that are
13 assigned to the Joint Space Operations Center out at
14 Vandenberg do that work each and every day and keep the
15 domain safe for the world.

16 Senator Peters: Thank you.

17 Senator Fischer: Senator Peters, did you return that
18 satellite?

19 Senator Peters: Yes, I did.

20 Senator Fischer: We do not need another one, right?

21 Senator Sullivan?

22 Senator Sullivan: Thank you, Madam Chair.

23 I want to thank the panel. It is a very impressive
24 group of public servants and military officers.

25 Secretary Wilson, welcome. We are all glad to see you

1 here in your position. And I think you always hear this
2 from different Senators, like Senator Peters. I look
3 forward to you coming up to Alaska. You will see that we
4 are the hub of air combat power for the Asia-Pacific and the
5 Arctic and training with JPARC.

6 And the young men and women in the Air Force in my
7 State, as you know, have been very busy with five F-22
8 intercepts of Russian Bear bombers just within the last
9 month. So they are doing a good job protecting American
10 sovereignty and airspace.

11 So thank you for the great leadership all of you are
12 doing with regard to the young men and women who are doing
13 such a great job.

14 We are also a cornerstone of our Nation's missile
15 defense up in Alaska. I want to talk a little bit about
16 missile defense and what we can be doing better on that.

17 It has become very clear, and you were talking about
18 the test by North Korea this past weekend, but all the
19 public testimony is it is not a matter of if but when Kim
20 Jong Un is going to be able to range the United States, and
21 it is not just Alaska and Hawaii but the lower 48, with an
22 intercontinental ballistic nuclear missile. That is going
23 to happen at some point. He is going to have that
24 capability.

25 I think that we need to do more to be able to protect

1 the homeland, to be able to say that, if you launch one, or
2 two, or three of these missiles, that we will have a 99
3 percent chance of shooting them down, and then we will
4 massively retaliate against you, which I think will keep
5 even a crazy guy even a little bit more sane, in terms of
6 trying to do something like that.

7 But I do not think we are there yet, so I think we need
8 to do more, and I am going to be introducing a bill that we
9 have been working on for months with some of the experts in
10 Washington and other places on increasing our missile
11 defense capability. I am certainly going to look to make
12 that a strong bipartisan bill.

13 One element, actually a key element of that bill,
14 relates to the topic we are talking about here, and that is
15 space and space sensors with regard to our missile defense.

16 General Goldfein, you articulated well the idea of an
17 integrated and layered defense. But, as you know, it is not
18 just Bagram Air Base. It is also our missile defense that
19 we need to do that.

20 So General Hyten has stated in testimony that, "The
21 deployment of a global space-based sensor system with
22 discrimination capability will be a critical component to
23 improving the effectiveness of our deployed missile defense
24 interceptors." That is his testimony.

25 Admiral Syring similarly stated, "From a missile

1 defense perspective, we have to develop a future operational
2 space layer. Given where the threat is going with
3 hypersonics and more ICBMs, this persistent tracking and
4 discrimination capability from space is a must for our
5 missile defense."

6 So I would like to ask the whole panel -- maybe,
7 General Raymond, starting with you -- how would space-based
8 sensors benefit our missile defense system, help with a
9 layered and integrated defense, whether it is GBIs in Alaska
10 or THAAD throughout the world, South Korea, or Aegis Ashore,
11 Patriot? How is that important?

12 Would that give us the persistent, unblinking eye and a
13 stronger ability to have layered missile defense, which in
14 my view we need today? We need it today, and we do not have
15 it. How critical are space sensors in that regard?

16 General Raymond: I think it is very critical. I would
17 agree with the previous testimony that you cited. I think
18 space, if you look at the little handout that we provided
19 and you look at the orbits, space provides persistence.
20 Space provides that unblinking eye. Space provides the
21 ability to discriminate, especially for maneuvering targets.

22 We have a great partnership with MDA. In your State,
23 Senator, we have a missile warning radar. We are in
24 partnership as we speak with MDA to modify that to be a more
25 capable missile defense capability, so we have a long

1 partnership both on the ground. We have capabilities in
2 space today with our space-based infrared satellites and
3 with our defense support program satellites, DSP and SBIRS,
4 that provide utility to the Missile Defense Agency.

5 But the layer that you talked about I think would be
6 important. It would give you persistence, field-of-view,
7 and the ability to discriminate.

8 Senator Sullivan: Anyone else want to comment?

9 General Greaves?

10 General Greaves: Senator, I will agree entirely with
11 General Raymond. Space and Missile Systems Center has been
12 in very close contact with the Missile Defense Agency over
13 the past few years, understanding where we can partner and
14 where space can benefit.

15 Space offers the opportunity from its vantage point for
16 the promise of birth-to-death tracking, which aids in the
17 discrimination problem that is at the central core of the
18 efficient use of our interceptors. We have been working,
19 some of it is classified, with MDA to hopefully jointly
20 determine what would benefit the missile defense mission as
21 well as the space surveillance mission within the Air Force,
22 so that work is ongoing.

23 Senator Sullivan: Great. I think you will like -- I
24 am not going to presume that you will support this bill, but
25 from the testimony, I think you will appreciate what we are

1 trying to do here in the Senate.

2 Ms. Chaplain?

3 Ms. Chaplain: Yes, I also oversee our missile defense
4 work. The capability that you are talking about, there has
5 been a requirement for that since the 1990s. There have
6 been several attempts to actually build that constellation.
7 One issue is it is very expensive to get that capability
8 because it is usually in low-Earth orbit and you have to put
9 up more satellites.

10 One issue that has sort of been recurring --

11 Senator Sullivan: Just to make a point on that, we
12 have been looking at some of the costs, and my view is,
13 buying insurance with regard to a nutcase who wants to try
14 to nuke Chicago at some point, or threaten to do it, the
15 expense should not be our first priority. Defending the
16 Nation should be our first priority.

17 I understand we have the capability to do it, and I
18 think, as you have been talking about, we have been talking
19 about it since the 1990s. This bill is meant to say let's
20 do it. Enough talk. We have a threat. We have a threat, a
21 real threat right now, a madman possibly could be
22 threatening 300 million people in the next year or 2 with an
23 intercontinental nuclear ballistic missile.

24 So I just get a little tired of the discussion of,
25 "Well, it is going to cost a little bit more." I think the

1 average American would take that insurance policy in a
2 heartbeat to say we have a 99 percent chance of shooting
3 down a missile when right now we do not.

4 I do not know exactly what you believe the number is in
5 terms of our chances, but we need to up the chances and the
6 probability of being ready to take out any threat that this
7 guy daily -- daily -- threatens our country with. We should
8 not take those threats lightly.

9 Ms. Chaplain: I think, given the expense, though, you
10 can maximize that satellite's use by bringing in other
11 requirements. One up for discussion is base situational
12 awareness. The same satellite can serve different
13 communities. It helps you be able to pay for that mission
14 even more.

15 General Raymond: And we are working very closely with
16 Missile Defense Agency toward that end.

17 Senator Sullivan: Madam Secretary, any comments?

18 Ms. Wilson: Senator, I would just say one thing. You
19 have highlighted the need to do more. All of these things
20 and other missions for the Air Force, we are not going to
21 meet the needs of the Nation unless we figure out a way to
22 get beyond the Budget Control Act. That is going to require
23 a lot of work between the Congress and the administration to
24 figure that out.

25 Senator Sullivan: Thank you.

1 Senator Fischer: Thank you, Senator.

2 Senator Heinrich?

3 Senator Heinrich: Thank you, Madam Chair.

4 Secretary Wilson, General Goldfein, in your
5 testimonies, you state that current policy does not fully
6 address space deterrence requirements for action in the 21st
7 century. Given the reliance we have today, and it has been
8 discussed by a number of you, for space, for secure
9 communications, intelligence collection, missile defense,
10 GPS, and many other missions, what are your thoughts on
11 whether it is time for the United States to engage in an
12 international conversation about an international space code
13 of conduct and whether we should be negotiating with other
14 nation-states on such a thing?

15 Secretary?

16 Ms. Wilson: Senator, that is probably a policy issue
17 far beyond the Air Force. The Air Force's role will be to
18 be ready to defend what we believe will be a contested
19 environment irrespective of any international norms of
20 behavior. I think the Air Force intends to and does comply
21 with national norms of behavior and, in fact, enables a lot
22 of those norms by providing information on where debris is
23 and so on and so forth. But we must --

24 Senator Heinrich: Do you have thoughts on potential
25 pitfalls or potential advantages of having such a code of

1 conduct in place?

2 Ms. Wilson: Senator, I have to say that from an Air
3 Force perspective, I think what we have to do is to be able
4 to prevail in what will inevitably be a contested
5 environment irrespective of consensus on international
6 norms, because there will be players who do not abide by
7 those norms.

8 Senator Heinrich: Yes. It is about risk mitigation
9 more than anything else. That is why I asked the question.
10 General?

11 General Goldfein: Thanks, Senator. In some ways, the
12 intent of the National Space Defense Center when it began
13 was to actually take a look at how we coordinate our
14 activity beyond just the Department of Defense for other
15 operations that are taking place in space.

16 Right now, it is centered on defense and intelligence
17 and taking a look at not so much who commands and who
18 controls but actually at how we coordinate our activity.
19 And an international set of norms relative to how we
20 coordinate activity beyond defense and intelligence is
21 probably a reasonable dialogue to have.

22 But I am with the Secretary here. That is probably a
23 policy-level discussion.

24 Senator Heinrich: So one of the GAO's recommendations
25 is to delegate decision-making to the lowest level

1 practical. Do each of you agree with that recommendation?
2 Do you think that this extends to the hiring of qualified
3 individuals and the issuance of contracts?

4 I will give you a little background. The reason why I
5 am bringing this up is that in addition to the delays in
6 issuing contracts, I have heard a lot from recent graduates
7 about significant delays, sometimes over a year, in terms of
8 extending a job offer.

9 Just last week, a number of my colleagues and I sent a
10 letter to Secretary Mattis about direct hire authorities,
11 urging that each of you help implement those authorities
12 across-the-board within the Air Force but particularly
13 concerned about AFRL.

14 So I just wanted to get your sense for how you view
15 that recommendation and how far you think it extends.

16 Ms. Wilson: Senator, in general, yes. The decision-
17 making should be at the lowest practical level. In that
18 regard, I would highlight the acquisition authority that was
19 just recently returned to the Air Force. We are working
20 that through with the Department of Defense now.

21 With respect to hiring, I am not sure what the cause
22 was behind what you identify. But remember we also just
23 went through a hiring freeze and also an uncertain budget
24 situation. Sometimes those decisions are based on the fact
25 that we just have no certainty with respect to the budget,

1 and budget certainty does affect managers' decisions.

2 Senator Heinrich: Absolutely. My understanding is
3 that was not the case, but we will get you those details, so
4 you fully understand the situation.

5 General Goldfein: Sir, I will let General Greaves and
6 General Raymond talk to the specifics on acquisition and
7 decision speed and decision authority.

8 What I would like to highlight for you is the
9 importance of looking at this from both requirements and
10 acquisition, because to acquire, you have to start with a
11 very firm set of requirements. Here is where I think we
12 have to get to. The analogy that I would offer you is that
13 today we are building a tanker called the KC-46. We are not
14 building that for the United States Air Force. We are
15 building that for the joint force because anybody who needs
16 airborne refueling is going to use the KC-46, to include our
17 allies and partners.

18 The chief requirements officer for the KC-46 is the
19 Chief of Staff of the Air Force. If anybody wants to change
20 the requirements, they have to come to me to change those
21 requirements.

22 We have to get to the same level of decision authority
23 and deliberate oversight of requirements in the space
24 business the same way that we acquire others. So as we work
25 our way through decision authority in acquisition, there is

1 an equivalent discussion we need to have about decision
2 authority for holding requirements firm.

3 General Raymond: I would pile onto that. I think
4 strengthening requirements at all levels is important. I
5 think the other piece of this that is important is making
6 sure that we have the analytical rigor to inform those
7 requirements. When we have that analytical rigor, we have
8 been able to move pretty rapidly. Then I would also add
9 that we are also focused on using rapid acquisition
10 authorities more broadly than what we have done in the past.

11 Senator, in your State, we have the Operationally
12 Responsive Space Office, and we are working hard to use
13 those authorities more broadly.

14 Senator Heinrich: Great.

15 General Greaves: Senator, as the Commander of SMC, I
16 think the single biggest improvement we can make you have
17 already provided language for. But as Secretary Wilson
18 said, moving the milestone decision authority back to the
19 services, and as the Secretary said, we are working within
20 the department to execute that.

21 As far as contracts, I know specifically with our
22 advisory and assistance contracts, our support contracts, 3
23 or 4 years ago, there was a problem with those contracts.
24 Within the last 3 years, we optimized and consolidated the
25 requirements process that generates those contract awards.

1 We have seen a drastic reduction in the time needed to award
2 those contracts, so we are addressing those.

3 Thank you.

4 Senator Heinrich: Thank you, General.

5 Senator Fischer: Thank you, Senator.

6 Senator Warren?

7 Senator Warren: Thank you very much, Madam Chair.

8 Thank you all for being here.

9 Secretary Wilson, it is good to see you here. I hope
10 we are going to get to see you in Massachusetts as well.
11 You have a standing invitation to come visit our bases. I
12 want to make sure we get our plug in too for Massachusetts.

13 I want to talk about where we are right now with the
14 commercial sector. The commercial sector seems to be
15 charging ahead in space. One area where commercial advances
16 have been astounding has been in imagery. Today's
17 commercial satellite imagery is often very high quality.
18 They are even taking HD video from space.

19 Meanwhile, our intelligence surveillance and
20 reconnaissance is what I understand the Pentagon calls a
21 high-demand, low-density asset, which means everybody wants
22 it and there is not enough to go around.

23 So let me start, General Goldfein, if I could, how is
24 the department incorporating commercial imagery as a service
25 into its approach? And conversely, how do you think about

1 the risks that the wide availability of imagery pose for the
2 United States?

3 General Goldfein: Yes, ma'am. The reality is we sense
4 the globe in domains: air, land, sea, space, cyber. Then
5 someone has to take all those ones and zeros and turn it
6 into decision quality information to allow us to achieve
7 decision speed. Much of that falls on the Air Force. We
8 are continually looking at ways to integrate nontraditional
9 means of intelligence into that sensing so that we can fuse
10 that into this common operational picture.

11 I will tell you that we are using commercial imagery.
12 We are using other sources that can bring -- we are using
13 social media in ways that we have not before, so this is a
14 broader discussion about how you leverage public-private
15 partnerships and the commercial industry to be able to
16 increase your decision speed and your ability to get that
17 common operational picture.

18 Senator Warren: So let me then just follow up on that
19 a little bit, General. Our satellite programs are
20 incredibly complex. They are also incredibly expensive.
21 Oftentimes, a single satellite can cost billions of dollars.
22 Meanwhile, the advances in technology on the commercial side
23 are making sophisticated technology smaller, lighter,
24 cheaper, every day.

25 A little startup company in Massachusetts can buy a

1 small, lightweight CubeSat -- I think you said you have one
2 of those here -- for less than \$10,000, and it does not cost
3 much more than that to launch it into space.

4 I get it, that a CubeSat obviously does not have the
5 same capabilities as the next generation GPS, but it seems
6 like there are some missions that a smaller or less
7 technically sophisticated satellite would do just as well.

8 Maybe I could include you in this, General Greaves.
9 How do you assess the tradeoffs between large, technically
10 sophisticated satellites and smaller but potentially less
11 powerful constellations? How do you think about that?

12 General Greaves: Senator, we actually think about that
13 daily, and it is part of our acquisition strategies that we
14 develop.

15 Just one example, one vignette, for the space-based
16 infrared system that flies out of Colorado, we are setting
17 up a data framework consortium to essentially go after
18 commercial capability to integrate into our tools,
19 applications, and processing lab to essentially ingest
20 commercial data, whether it is imagery or OPIR or other
21 sensors, and combine that with what SBIRS produces, as an
22 example, and exploit that and fuse it and send it out to
23 users. That is just one example.

24 Senator Warren: I have to say, I am really glad that
25 you are thinking about this and you think about the ways

1 that you can integrate.

2 It seems to me that a high-low mix of advanced and more
3 basic capabilities in our satellite inventory would be a
4 good way to think about it, kind of the same way we think
5 about aircraft in this area. Capitalizing in advances,
6 though, in technology is possible only if we can afford to
7 do it.

8 But, Ms. Chaplain, a lot of our space acquisitions seem
9 to remain bogged down. Last year, the GAO reported that
10 several of the department's most critical space programs
11 remain overbudget and behind schedule. So, Ms. Chaplain,
12 could you say a word about how the department, what it
13 should be doing to stay on schedule and to rein in costs in
14 this area?

15 Ms. Chaplain: I think a two-pronged approach is
16 needed.

17 One, you really need to focus on the acquisition
18 fundamentals. In recent reports, we are hearing issues
19 about systems engineering, contractor performance, lots of
20 management and oversight issues that seem to persist. So
21 those really need to be addressed.

22 And then on the second-pronged approach, really looking
23 at the fragmentation and leadership so that we can speed up
24 decision-making, be more agile, get agreements early on.
25 That does not really happen as much as it should on space.

1 And I agree with you about the commercial suppliers,
2 and can they be brought in to offer a mix of approaches?
3 For years, commercial suppliers have always felt like it is
4 "talk to the hand" when it comes time to deal with the
5 Department of Defense. Maybe you have heard of that. There
6 is also a lack of contracting mechanisms to help them engage
7 with defense, especially when it comes to things like buying
8 bandwidth or something like that.

9 DOD has been trying some prototype efforts to be able
10 to buy services better, but I think a lot more can be done
11 to bring in that kind of innovation.

12 Senator Warren: Good. I am very glad to hear this.
13 Obviously, the cost growth in the satellites is limiting our
14 capacity to buy what it is that we need to buy. We owe it
15 to the taxpayer, we owe it to our national security, to get
16 these costs down to a place that we can get the full range
17 of response that we need.

18 So thank you all very much. I appreciate it.

19 Thank you, Madam Chair.

20 Senator Fischer: Thank you, Senator Warren.

21 I believe we have some time left in the hearing. There
22 might be other Senators who are going to be coming to ask
23 questions, so we will begin just a short second round, if
24 Senators have a follow-up question.

25 I would recognize Senator Sullivan.

1 Senator Sullivan: Thank you, Madam Chair.

2 General Goldfein, I just want to follow real quick on a
3 statement you made about the KC-46 and your authority on the
4 requirements change.

5 Was that as a result of the NDAA amendments just 2
6 years ago on acquisition reform to give the service chiefs
7 more authority on acquisition?

8 General Goldfein: Actually, it did strengthen the
9 authority of the chiefs. And actually, I would argue, it
10 also strengthened the accountability of the chiefs for
11 having responsibility for assigning milestone decision
12 authorities.

13 However, the responsibility of the chief of staff of a
14 service to hold requirements firm actually did not change
15 with --

16 Senator Sullivan: That had previously existed?

17 General Goldfein: Yes, sir.

18 Senator Sullivan: Okay. Thank you.

19 I want to go back to the missile defense discussion we
20 were having. General Raymond, I was talking a lot about
21 space-based sensors, but given your experience -- and again,
22 I would open us up to the panel -- and given the threat that
23 is heightened that we are all acknowledging, particularly
24 from North Korea, can you talk about why some of the ground-
25 based radars like Cobra Dane and the upgraded early warning

1 radar and the LRDR radar that we are implementing now are
2 also very important with regard to our layered, integrated,
3 and strategic missile defense?

4 General Raymond: I think as you just ended the
5 question, layered defense, that is really what this is.
6 This is a network or a system of systems. Every piece of
7 that architecture provides advantages. From the space
8 capabilities, as we talked about, you get the persistence,
9 you get the field of view. From the ground-based radars,
10 you get discrimination, better discrimination capabilities.

11 So there are a host of sensors that are positioned
12 around the globe to be able to do that. They come together
13 as a network to be able to fuse that information into a
14 timely decision and be able to respond as a Nation in order
15 to do so.

16 But it is not just one capability. It is the mixture
17 of those capabilities that provides the national missile
18 defense capability that we need.

19 Senator Sullivan: So Cobra Dane, is that in good
20 shape? How important is that to tracking North Korean
21 missiles right now?

22 General Raymond: Cobra Dane, let me just say, I am not
23 responsible for missile defense mission. However, I will
24 say that it is a very important missile defense capability.
25 I would also tell you that we use that capability pretty

1 significantly to do space situational awareness as well. I
2 talked about earlier the thousands of objects that we are
3 tracking. We use that capability for that mission as well.

4 Senator Sullivan: Anyone else want to comment on this
5 ground-based -- General Greaves?

6 General Greaves: Senator, I would offer that the
7 discriminating radar that is going into Clear, Alaska, is
8 key to the future of effective missile defense. I believe
9 that is why Admiral Syring proposed that it be positioned
10 there, because it is a mix of, if you add the SPX floating,
11 X-Band Radar, mix of phenomenology that is used to
12 characterize the threat versus decoys, and radars are
13 critical to that.

14 Senator Sullivan: Thank you.

15 General Raymond: The other piece of this is that you
16 also need, as we talked about earlier, when there is a
17 launch, you have to determine really quickly, is it a
18 regional threat? Is it a threat to our homeland? Or is it
19 a threat to space? Or is it a space launch?

20 So those capabilities, wherever they are around the
21 world, help us discriminate against that and then provide us
22 the -- help support the supporting relationships to handle
23 those.

24 Senator Sullivan: Did you have a comment, General
25 Goldfein?

1 General Goldfein: Sir, I was just going to say, in my
2 role as the air defense commander in Central Command and
3 responsible for defending the Arabian Gulf from potential
4 Iranian missiles, one of the things that we have not talked
5 about in this discussion is the importance of attribution
6 and ensuring that not only do we characterize the missile
7 very quickly so we can defend, but also so we can have
8 irrefutable evidence that we can present that said it came
9 from this country.

10 Senator Sullivan: Right.

11 Let me just ask one final question, Madam Secretary, if
12 I may, just since the two leaders of the Air Force are here.
13 How is morale with our young men and women in the Air Force,
14 for both Madam Secretary and General Goldfein?

15 Ms. Wilson: Senator, I am probably not able to comment
16 on that yet in any detail, because I have not been out in
17 the field. But I have a rule that any day out of the office
18 and in the field is a good day, and I hope to be out doing
19 things and spending time with airmen.

20 I think my first opportunity to do that will be next
21 week, and I have a number of engagements in Colorado next
22 week.

23 Senator Sullivan: Great.

24 General Goldfein: Senator, I will tell you my belief
25 is that readiness and morale are inextricably linked. Where

1 we have high readiness, we have high morale. If you walk
2 the line today at Bagram and if you walk the line today at
3 Kunshan in Korea, you are going to find high morale, because
4 they have people, they have parts, they have what they need.
5 They are flying at a high rate, and we keep them at a very
6 high level of readiness. So their morale is very high.

7 There is a bill payer to get that level of readiness,
8 and that is against all the bases now who have to contribute
9 forces -- personnel, supplies, equipment, and often aircraft
10 -- to be able to get that high level of readiness forward to
11 fight tonight. Their readiness is at a lower level. eThat
12 concerns me because that is the force we are going to rely
13 on if a contingency kicks off.

14 So where you have lower levels of readiness, you are
15 going to find low morale, because a pilot who does not fly,
16 and air traffic controller who does not control, a
17 maintainer who does not maintain, is not going to stay in
18 this business, because we are not giving them the
19 opportunity to be the best they can be in their business.

20 Senator Sullivan: Thank you.

21 Senator Fischer: Thank you, Senator.

22 Senator Heinrich?

23 Senator Heinrich: General Greaves, back to the issue
24 of contracts for just a minute, I have spoken quite a bit in
25 recent years about the significant amount of time that it

1 takes to award contracts to small satellite businesses. In
2 New Mexico, the delays have sometimes extended to one or
3 more years before receiving approval. You and your team at
4 SMC recently announced a space enterprise consortium that
5 would use other transaction authorities to will help speed
6 up that process.

7 How would you describe the industry response so far to
8 the consortium RFI? How will the consortium accelerate the
9 solicitation-to-award timeline?

10 And finally, I just want to say thank you to you and
11 Colonel Anttonen for your leadership on this issue.

12 General Greaves: Thank you, Senator.

13 The response of industry has been enthusiastic. By
14 using the other transaction authority as we have done
15 recently with our rocket propulsion system work, industry
16 sees, as you mentioned, reduced timeline, increased
17 responsiveness, and ability to execute their business case.

18 As far as timelines, the final coordination on the
19 consortium direction is going through headquarters Air Force
20 today. We expect to release it in 30 days and, by the end
21 of July, to reward our first contract. That contract will
22 be supporting development of tactics, techniques, and
23 procedures in support of the space warfighting construct.

24 Senator Heinrich: Thank you.

25 Senator Fischer: Thank you, Senator.

1 Senator Cotton?

2 Senator Cotton: Thank you, Madam Chair. I apologize
3 for my tardiness. I had presiding officer duty. It is very
4 much a duty, not an honor, which blue suiters know, it is
5 like staff duty when you are a lieutenant.

6 I understand, General Goldfein, that, in your opening
7 statement, you spoke about the space corps, which is one of
8 the approaches the GAO reported could resolve the
9 fragmentation within the DOD, the separate space force. You
10 said you do not support it at this time.

11 Could you elaborate a little bit on the reasons for
12 that?

13 General Goldfein: Yes, sir, because, right now, we are
14 at this point in our history relative to the criticality of
15 space that we are evolving from treating space as a domain
16 that is relatively benign from which we report, sense, and
17 monitor, to a domain that we have to fight in should a war
18 extend or start -- extend into space or start in space.

19 So as we make this transition right now and we look at
20 our operating construct and normalize joint warfighting, I
21 would not recommend to this committee that we would go to a
22 corps right now, because anything that separates space and
23 makes it unique and different relative to all of the
24 warfighting missions that we perform that are reliant on
25 space, I do not believe that will move us in the right

1 direction at this time.

2 Senator Cotton: Ms. Chaplain, would you care to
3 provide any thoughts?

4 Ms. Chaplain: Yes, I understand that point of view.
5 In our report, we laid out options. We did not make a
6 particular recommendation, because we think how it affects
7 operations needs to be taken into account.

8 But I will say that the solutions tried to date that do
9 not separate space as people think it should be separated
10 have not worked very well. The reasons that people in these
11 prior studies and even today believe that there needs to be
12 some kind of segmentation is to protect the space budget, is
13 to leverage expertise for the work force, and is to really
14 clearly designate who is in charge. So if it is not going
15 to be that, it needs to be some kind of solution that does
16 those things.

17 Senator Cotton: Thank you.

18 General Goldfein, you mentioned the difference between
19 the benign environment that we are used to and increasing in
20 a warfighting environment, which your joint statement from
21 all the witnesses says right there on page 2.

22 What exactly is the risk that we face in space now, in
23 layman's terms, so the ordinary American can understand it?
24 Because I think most ordinary Americans do believe that
25 space is a benign environment.

1 General Goldfein: Well, again, to the average American
2 who goes to an ATM and pulls money out of that ATM, the
3 timing signal that ATM relies on comes from GPS satellites
4 that are flown and managed by the United States Air Force.
5 You want to take a look at not only how many activities are
6 dependent -- you can look at the transportation industry,
7 whether you want to talk airlines or trains, it is dependent
8 on that signal.

9 So just from a GPS constellation standpoint, I would
10 argue that, globally, this is a constellation that we have
11 to ensure that we are monitoring and protecting.

12 So when we call it a joint warfighting domain, the idea
13 here is that we actually now how to fight on land, at sea,
14 in the air, and we have tried and true tactics, techniques,
15 and procedures. So now is the time for us to apply those to
16 the space domain so it becomes further integrated and
17 normalized across how we fight.

18 So that is why anything that actually talks about the
19 business of separating and space in the same sentence I
20 submit to you is moving us in the wrong direction. Anything
21 that talks about integrating and normalizing space is moving
22 us in the right direction.

23 Senator Cotton: The threat to normal Americans about
24 their ATM machine sounds pretty dangerous. Who would do
25 such a thing? What countries or what adversaries would be

1 able to disable satellite constellations?

2 General Goldfein: Without going into -- I can get on
3 your schedule for more of a classified --

4 Senator Cotton: No, no, I know who they are. I was
5 just wondering if you wanted to say who they are.

6 General Goldfein: So right now, in terms of who we are
7 watching that is investing most in taking away our
8 advantages in space, the two countries that are making the
9 most investment in this area are China and Russia.

10 Senator Cotton: And the asymmetry that we face is just
11 inherent in our geopolitical situation? We sit here in the
12 new world and we try to project power in the old world
13 across the vast domains, and, therefore, we are inherently
14 going to rely more on the space constellation than any old
15 world power like Russia or China will?

16 Secretary Wilson, you look like you want to respond.

17 Ms. Wilson: Senator, let me take that one. It is not
18 just our role in the world. It is that we are really good
19 at it, and, hence, we have become heavily dependent on upon
20 it. When it was uncontested, that was a nice place to be,
21 but our adversaries know it, that we are heavily dependent
22 upon it and very good at it, and, hence, they see the
23 vulnerability.

24 So in any conflict, space is going to be contested. We
25 see the capabilities, and the folks can come up and brief

1 you in a classified way, but it is also their declaratory
2 policy. The Russians have publicly stated that this is part
3 of their declaratory policy, to develop capabilities to deny
4 us the use of space in any conflict.

5 Senator Cotton: Thank you all.

6 Senator Fischer: Thank you, Senator.

7 Senator Cruz?

8 Senator Cruz: Thank you, Madam Chairman.

9 Welcome, everyone. Thank you for being here
10 testifying.

11 Secretary Wilson, congratulations on your confirmation
12 and being sworn in. Thank you for your service once again.

13 Just a minute ago, you were visiting with Senator
14 Cotton about the threats from Russia and China in space and,
15 indeed, a couple of instances of potential conflict.

16 Russia's Kosmos-2499, a kamikaze satellite fashioned to
17 destroy American satellites, and China's Shiyang, a grappling
18 arm-equipped satellite that could remove U.S. assets from
19 their orbit, how serious do you estimate this threat is?
20 And what can be done to protect our assets from potential
21 hostile activity in space?

22 General Goldfein: Sir, I will tell you that we as the
23 service responsible for flying all 12 constellations and 90
24 percent of the architecture, we take this very seriously.
25 Without going into any kind of a classified discussion, I

1 will just tell you that layering our defenses and ensuring
2 that we truly understand and can characterize the threat,
3 and then perhaps just as importantly as the constellations
4 themselves, the command and control architecture that we are
5 building in to first characterize and then be able to get
6 the decision speed we need to respond quickly are all part
7 of the space operating construct that we are working toward.

8 Then I would like to turn it over to General Raymond as
9 well who is really the operational warfighter in this
10 business, because a significant portion of our effort is
11 actually also transitioning the space mission force into a
12 force that has been focused primarily on monitoring and
13 reporting and actually focused on fighting.

14 Senator Cruz: General Raymond?

15 General Raymond: Thank you, Senator.

16 As I look at it, I have four imperatives, and in any
17 warfighting domain, and I would characterize space as a
18 warfighting domains just like air, land, and sea, in any of
19 those warfighting domains, you have to have the ability to
20 command and control forces in that domain. You have to have
21 the ability to have space situational awareness or
22 situational awareness in that domain. You have to have an
23 architecture that is defendable. And you have to have, as
24 the chief just mentioned, professionally developed airmen
25 that can fight and be joint warfighters.

1 Those four areas are where I am focused. We have made
2 some pretty significant strides in battle management
3 command-and-control. We are working hard in partnership
4 with the National Reconnaissance Office in space situational
5 awareness, and with other partners, including commercial
6 space in developing ConOps on how we go about disaggregating
7 that architecture and coming up with architecture. We work
8 that very closely with national reconnaissance as well.

9 Then on the space professional development piece, we
10 are making sure that our airmen have the ability to
11 participate in exercises, wargames, go to the right
12 training, the right schools, to be joined warfighters.

13 Senator Cruz: What vulnerability would we have to a
14 nuclear device in a satellite? And what could be the
15 potential harms to the homeland if a nuclear device were
16 detonated in orbit?

17 General Raymond: So, Senator, I would say that there
18 is a spectrum of threats that we would be concerned about.
19 They would go from anything from the low end of reversible
20 jamming of communication satellites and GPS satellites, for
21 example, up through directed energy, up through what we saw
22 demonstrated in 2007 by the Chinese with the direct-ascent
23 ASAT. Then I would put at the far end of that spectrum
24 nuclear devices detonated in space, which would have very
25 significant impacts across our constellations.

1 General Greaves: Senator, I would add that our most
2 critical satellites with those capabilities, they have been
3 designed to operate through the environment you just
4 mentioned. In this forum, that is all I can say.

5 Senator Cruz: And what would the risks be of an EMP
6 from a nuclear device detonated in orbit?

7 General Greaves: Senator, again, it would depend on
8 the type of satellite systems. Our big data pipe, wide-band
9 global satcom would be less protected than our most critical
10 -- satellites that are in the nuclear chain of command,
11 those would be able to fight through that sort of
12 environment.

13 Senator Cruz: But we do have -- it is correct that
14 North Korea has satellites orbiting right now?

15 General Raymond: They have one satellite. I call it a
16 piece of debris. It is not very useful. It is more of a
17 statement that they have been able to put something in
18 orbit, which is concerning. But I do not consider it a
19 capability that provides them benefit.

20 Senator Cruz: What are the most vital steps necessary
21 to protect our assets in space, to prevent the space
22 architecture from being taken down?

23 General Raymond: I think there are a couple things you
24 have to do.

25 First of all, our plans are to make the capabilities

1 that we have today more defensible. So one thing you might
2 do is add some maneuverability capability to allow it to be
3 more agile. The other thing that we are working through is
4 looking at an architecture perspective.

5 How might you disaggregate, diversify? We had good
6 conversations earlier about the role of commercial space,
7 the role of our allies. How do you build that architecture
8 that puts you in a position day-to-day to be more
9 defendable?

10 Senator Cruz: Thank you.

11 Senator Fischer: Thank you, Senator Cruz.

12 I thank you all for coming today and being able to
13 present and discuss this very important topic with us.

14 Thank you all for your service to this country.

15 With that, we are adjourned.

16 [Whereupon, at 3:25 p.m., the hearing was adjourned.]

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