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HEARING  
ON  
NATIONAL DEFENSE AUTHORIZATION ACT  
FOR FISCAL YEAR 2018  
AND  
OVERSIGHT OF PREVIOUSLY AUTHORIZED  
PROGRAMS  
BEFORE THE  
COMMITTEE ON ARMED SERVICES  
HOUSE OF REPRESENTATIVES  
ONE HUNDRED FIFTEENTH CONGRESS  
FIRST SESSION  
SUBCOMMITTEE ON STRATEGIC FORCES HEARING  
ON  
**FISCAL YEAR 2018 PRIORITIES AND  
POSTURE OF THE NATIONAL SECURITY  
SPACE ENTERPRISE**

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## **FISCAL YEAR 2018 PRIORITIES AND POSTURE OF THE NATIONAL SECURITY SPACE ENTERPRISE**

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HOUSE OF REPRESENTATIVES,  
COMMITTEE ON ARMED SERVICES,  
SUBCOMMITTEE ON STRATEGIC FORCES,  
*Washington, DC, Friday, May 19, 2017.*

The subcommittee met, pursuant to call, at 7:59 a.m., in room 2118, Rayburn House Office Building, Hon. Mike Rogers (chairman of the subcommittee) presiding.

### **OPENING STATEMENT OF HON. MIKE ROGERS, A REPRESENTATIVE FROM ALABAMA, CHAIRMAN, SUBCOMMITTEE ON STRATEGIC FORCES**

Mr. ROGERS. Good morning, and welcome to the Strategic Forces Subcommittee hearing, "Fiscal Year 2018 Priorities and Posture of the National Security Space Enterprise." We are honored to have a panel of expert witnesses who are leaders in our national security space program to join us here today. And before I introduce them, though, I want to take a moment to acknowledge that, while I can't imagine there being a better place to work than for the Strategic Forces Subcommittee on the House Armed Services Committee, apparently, somebody thinks there is a better job in Washington, DC. This will be the last hearing that Steve Kitay will be in his current position. He is leaving us to go work for the Secretary of Defense, he will be the Assistant Secretary of Defense for Space Policy. And our loss is the Secretary's gain. So we are going to miss him. He has been with us as long time and does a great job. But I know he will do a great job for our country in his new capacity as well. So good luck, buddy.

Today we have some witnesses that are very familiar to this committee, and do a great job for our country: General John "Jay" Raymond, Commander, Air Force Space Command; Lieutenant General David Buck, Commander, Joint Functional Component Command for Space [JFCC Space]; Ms. Betty Sapp, Director of National Reconnaissance Office; Robert Cardillo, Director of National Geospatial-Intelligence Agency; and Mr. John Hill, Acting Deputy Assistant Secretary of Defense for Space Policy.

After we finish this unclassified testimony and questions and answers, we will adjourn to a closed session to continue our oversight in an appropriately secure fashion.

In Secretary Mattis' confirmation hearing in front of Senate earlier this year, his official testimony stated, quote, "While our military maintains capable air, land, and sea forces, the cyber and space domains now demand an increasing share of attention and

investment,” close quote. And I fully agree with the Secretary’s statement.

Our military and intelligence leaders have been clear in their warnings, some going back many years, that our use of space could be taken away from us in the next military conflict. However, we have not moved with the conviction and urgency to respond to these warnings. And this has left us with a growing crisis to confront in outer space.

While I have the full faith and confidence in each of our expert witnesses here today, I do not have faith in the tangled bureaucratic structure they must work with. Meanwhile, China, for example, is advancing rapidly in space and counterspace and has established a new military organization to focus its space, cyber, and electronic warfare capabilities. Dr. John Hamre, former Deputy Secretary of Defense, eloquently stated in an earlier hearing to this subcommittee, quote, “We are not well organized to deal with the new challenges we face in space. The old structure may have been sufficient when space was an uncontested area of operations. That time has passed.” Again, I couldn’t agree more.

Ladies and gentlemen, now is the least capable our adversaries will be in space. And now is the time for reform, even if it is disruptive today.

With that, I look forward to hearing all your perspectives on space priorities and posture. I thank all of you for being here and working with us on this important topic.

I now recognize my friend and colleague from Tennessee, the ranking member, Mr. Jim Cooper.

[The prepared statement of Mr. Rogers can be found in the Appendix on page 29.]

**STATEMENT OF HON. JIM COOPER, A REPRESENTATIVE FROM  
TENNESSEE, RANKING MEMBER, SUBCOMMITTEE ON STRA-  
TEGIC FORCES**

Mr. COOPER. Thank you, Mr. Chairman. I would like to add my note of congratulations to Steve, well done. And I thank you for this hearing, Mr. Chairman. I appreciate especially your focus on strengthening America’s space capabilities. There is no more important goal.

There are many issues before us and before the Air Force in particular, but I am glad we are addressing them in a bipartisan, joint, and substantive fashion. I look forward to the testimony of the witnesses.

Mr. ROGERS. Great. I now recognize our witnesses. The witnesses were asked to summarize. Their prepared statements will be submitted for the record. Without objection, so ordered. If you could take your statements and keep them to 5 minutes or less so we can get to questions, that would be awesome.

General Raymond, you are recognized.

**STATEMENT OF GEN JOHN W. RAYMOND, USAF, COMMANDER,  
AIR FORCE SPACE COMMAND**

General RAYMOND. Thank you, Chairman Rogers, Ranking Member Cooper. Let me also pile on and say congratulations to Steve

Kitay. We look forward to having you sitting here next to us next year.

Distinguished members of the subcommittee, thank you for the opportunity to appear before you as the commander of Air Force Space Command. It is my distinct privilege to lead and represent nearly 36,000 professional and dedicated airmen providing resilient and affordable space and cyberspace capabilities for the joint force and our Nation. It is also a distinct privilege to testify with my friends and panel of experts and close partners.

This is a very exciting year for both the Air Force and the Air Force Space Command. In 2017, September of 2017, our Air Force celebrates our 70th birthday, and Air Force Space Command celebrates a 35th birthday, although, as an Air Force, we have been involved in space since 1954 and since the beginning.

We have come a long way and done a remarkable job integrating space capabilities into joint warfighting. Today, there is nothing we do, and I repeat, nothing we do as a joint force that isn't enabled by space. Integration has been our strength. Nevertheless, we find ourselves at the intersection of high reliance and vulnerability in the space domain. Today, in no uncertain terms, space is a warfighting domain, just like air, land, and sea. Potential adversaries are developing capabilities to deny us access to and the benefits of the space domain. Let me be very clear, we do not want a conflict that extends into space, but one way to keep that from happening is to make sure that we are prepared for it and be able to fight and win that conflict if it were to occur. I think it shouldn't be lost on anybody that our space program is the envy of the world.

My near-term priorities are fourfold. First, in partnership with Betty Sapp, is to operationalize the National Space Defense Center, and provide them with command and control capability necessary to operate in a contested domain.

Secondly, we must improve space situational awareness, transforming from a cataloging focus to a warfighting focus required of this domain.

Third, we need to transition our space architecture into a defendable space architecture to provide resilient and defendable capabilities for the current strategic environment that we face.

And finally, we need to continue to professionally develop Air Force Space Command airmen.

I thank you for your support, I thank you for your active leadership, and look forward to continuing to work closely with you in the years ahead. I also look forward to your questions.

[The prepared statement of General Raymond can be found in the Appendix on page 31.]

Mr. ROGERS. General Buck.

**STATEMENT OF LT GEN DAVID J. BUCK, USAF, COMMANDER,  
JOINT FUNCTIONAL COMPONENT COMMAND FOR SPACE,  
U.S. STRATEGIC COMMAND**

General BUCK. Chairman Rogers, Ranking Member Cooper, and members of the subcommittee, thank you for your steadfast support of our men and women in uniform, the space enterprise, and this Nation.

As this committee is well aware, we have turned an educational corner of sorts. It is now widely acknowledged that space is critical to our way of life. This, coupled with an understanding of the compelling and compounding threats to our freedom of action in space is the burning platform to evolve our national security space enterprise.

We don't need a clean-slate approach, but certainly, an overhaul is necessary to guarantee our freedoms in, through, and from space.

This is a challenge, because our national security space architecture and processes were largely conceived to provide services, or commodities, during an era when our most significant co-orbital threat was debris. Given the emerging threats, we no longer approach space with simply a service provider mentality. Our foremost responsibility is to gain and maintain space superiority. This is a prerequisite to protecting and defending the space joint operating area, and for providing space force combat engagement with the joint forces across the globe.

Over the past year, we have made substantial progress, especially with respect to all-domain operations and our ability to protect and defend the national security space enterprise. We are better warfighters. There are, however, areas that require continued focus and vigilance. We must continue to normalize operations across the enterprise. This includes space situational awareness, as well as improving foundational intelligence, and the ability to provide robust indications and warning. We also must continue the full-court press to deliver a next generation battle space awareness and command and control capability. At the same time, we must review and update the associated authorities and rules of engagement for operations in space. And we must continue, we must continue to push on fielding required capabilities on operationally relevant timelines.

Looking forward, we are focused on maintaining freedom of action in space. It is an imperative of our joint force. As a learning organization, we will continue to review and mature our approaches and organizational structures. We can accept no less, because the speed and complexity of future fights demands operationally agile organizations.

Every challenge is an opportunity, and we have many opportunities in space. Freedom of action in space is not a birthright; it must be secured, and it must be preserved. This requires constant vigilance, strong partnerships, and active participation. I thank the committee for your leadership and for your advocacy. I look forward to our continued partnership.

[The prepared statement of General Buck can be found in the Appendix on page 50.]

Mr. ROGERS. I thank you, General Buck. Ms. Sapp you are recognized for 5 minutes.

#### **STATEMENT OF BETTY SAPP, DIRECTOR, NATIONAL RECONNAISSANCE OFFICE**

Ms. SAPP. Thank you, Chairman Rogers, Ranking Member Cooper, and distinguished members of the subcommittee. Thank you for the opportunity to be here on behalf of the National Reconnaissance

sance Office, or NRO. The NRO is responsible for developing, acquiring, launching, and operating the Nation's overhead intelligence, surveillance, and reconnaissance architecture. We are the foundation of the U.S. global situational awareness. We contribute to global intelligence, military and homeland security operations, while simultaneously assisting with the formation of national policy, and achieving diplomatic goals. We provide direct support to U.S. warfighters, help protect U.S. borders, and contribute significantly to the fight against ISIS [Islamic State of Iraq and Syria] and other counterterrorism operations worldwide.

The foundation of NRO mission capabilities and contributions are our people. Our people are behind every mission success, and enable the direct support we provide to the combatant commands, their service and functional components, and deployed tactical units. The NRO workforce is not just dedicated to mission, but talented and empowered to innovate.

We instill a culture of innovation and risk tolerance in everything we do. NRO innovation comes in many forms to include using existing capabilities differently, developing new apps for our space and ground systems, and developing the new capabilities critical to closing intelligence gaps.

We are also working with our mission partners to ensure we fully leverage commercial products, services, and capabilities. The NRO is a small, flat, end-to-end organization, fully capable of successfully delivering an increasingly capable, integrated, resilient, and affordable architecture.

We have control of every function required, from the R&D [research and development] that enables us to stay ahead of targets and threats, to the acquisition of new space and ground capability, to the operations required to use, adapt, and upgrade those capabilities to respond to new and changing mission imperatives in the field.

We are performing extremely well. All 15 of our major system acquisitions are "green," meaning they are meeting or exceeding cost, schedule, and performance metrics. This year, we received our eighth consecutive clean financial management audit, demonstrating our ability to properly manage all resources entrusted to us. And we continue to improve our collection capabilities and the resiliency to stay ahead of targets and threats. But staying ahead of the adversaries who threaten our space capabilities is a challenge. Those adversaries are making space a priority, investing heavily and accepting the risk necessary for rapid progress.

The U.S. has not been keeping pace. I believe we have not made the investment that would indicate space is a priority or fundamental to the U.S. Our requirements budget and acquisition processes are disconnected, and none of them moves quickly. Failure is not well-tolerated, even in the research and development activities required to keep our space capabilities relevant and vital, or to improve their resiliency.

National security space is a team sport, and everyone on the team, those in the executive branch, and in the Congress, must do all they can to advance its capabilities and improve its resilience to threats. We must have processes that are integrated, that move

faster, and that demonstrate greater risk tolerance. We must recommit to space as a national priority and imperative.

This committee has been out in front trying to drive the changes required. The NRO is inspired by this committee's efforts to address the barriers to change and the pace of change required to advance national security space. The NRO, and the broader national space community, have people with the talent, commitment, and passion necessary to take us forward. We only need to empower and enable them to succeed.

Mr. Chairman and members of the subcommittee, thank you for your continued support of the National Reconnaissance Office, its people, and its mission.

[The prepared statement of Ms. Sapp can be found in the Appendix on page 63.]

Mr. ROGERS. Thank you, Ms. Sapp. The chair now recognizes Mr. Cardillo for 5 minutes.

#### **STATEMENT OF ROBERT CARDILLO, DIRECTOR, NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY**

Mr. CARDILLO. Thank you, Chairman Rogers, Ranking Member Cooper, and members of the committee. I, too, am pleased to testify before you today with my distinguished colleagues as a member of the team of national security professionals.

NGA is the primary provider of geospatial intelligence, or GEOINT, for the Department of Defense and the intelligence community. Our support to military services, combatant commands, and warfighters includes safety in navigation, precise targeting, disaster recovery, and tailored intelligence support, just to name a few. I also have the job of being the Functional Manager for the National System of Geospatial Intelligence. And I strengthen the overall enterprise by ensuring that those combatant command needs are met through future overhead architectures. More specifically, the GEOINT enterprise capability document which serves as a framework to translate those needs into the key enterprise functions and capabilities that our analysts require to resolve our most vexing intelligence challenges.

Now, global persistent GEOINT provides an architecture to monitor these intelligence challenges, enables NGA to provide national and tactical leaders the intelligence and early warning needed for decision advantage. It leverages the exquisite capabilities of the National Reconnaissance Office to allow the combatant commands to hold strategic targets at risk. It also integrates the capabilities of our international partners to fill gaps in our enterprise.

Now, the explosion of data has driven the GEOINT discipline beyond the limits of human interpretation and explanation. By combining all of the data now available to us, and with the use of algorithms, automated processing, machine-to-machine learning, and artificial intelligence, we believe we can automate as much as 75 percent or more of the rote tasks we perform today. This will free our analysts to spend more time and focus on those hard intelligence problems. Getting to that point will require significant investments in our IT [information technology] architecture, as well as in our research and development.

Not only is that data exploding, conservative estimates over the next 10 years predict that over 9,000 commercial satellites will be launched compared to fewer than 1,500 in the last 10 years. Accordingly, NGA will partner with the NRO to engage with and access the most mature of these new space via the commercial GEOINT activity. Through it, we will identify and evaluate emerging commercial GEOINT data and services against those needs that we capture and maintain.

In closing, the national security space enterprise is vital to NGA's ability to provide advantage to warfighter commanders and policymakers, to give them the decision space and the operational time they need to do their job. Timely, relevant, and accurate GEOINT is only possible through the combined efforts of the IC [intelligence community], the Department of Defense, emerging industry, and allied partners.

I am happy to address any questions you might have and I am pleased to be here. Thank you.

[The prepared statement of Mr. Cardillo can be found in the Appendix on page 70.]

Mr. ROGERS. Thank you, Mr. Cardillo. Mr. Hill, you are recognized for 5 minutes.

**STATEMENT OF JOHN D. HILL, PERFORMING THE DUTIES OF DEPUTY ASSISTANT SECRETARY OF DEFENSE FOR SPACE POLICY, OFFICE OF THE UNDER SECRETARY OF DEFENSE FOR POLICY**

Mr. HILL. Thank you, Chairman Rogers, Ranking Member Cooper, and distinguished members of the committee, thank you for the opportunity to testify today here with my distinguished colleagues.

In the months ahead, understanding and addressing the implications of the growing threats in space is critical as this administration prepares the President's new national security strategy, and the national defense strategy, and as Congress carries out its responsibilities for oversight and funding of the programs and activities necessary to realize those strategies.

No less important, strategic success requires increased resources, an end to defense budget caps, an end to the years-long pattern of extended continuing resolutions, and a return to strategy-focused resourcing. Today, we consider space security in an era when Russia and China present anti-access/area denial [A2/AD] strategies intended to prevent or counter U.S. intervention in crises or conflicts, and to undercut our ability to secure our interests.

Diplomatic solutions remain our preferred option to settling the differences that divide nations. But American diplomatic influence rests on the credibility and capability of our military power, which is fundamental to deterrence and to the confidence of our allies in knowing that they do not have to submit to the coercive pressures of large and powerful neighbors.

America's space posture underwrites deterrence by enabling the U.S. military to project power globally, respond to crises rapidly, strike swiftly and precisely, and command forces in multiple theaters simultaneously. Potential adversaries know well our reliance on space systems that many perceive as vulnerable, leading to an

unstable situation in which some have concluded that in times of conflict, attacking U.S. military space systems may make an irresistible and most tempting choice.

Disabusing them of such misguided notions is a strategic priority. That is why, in the Department of Defense, we are making such a concerted effort to strengthen the mission assurance of our space capabilities, and to deny aggressors the benefits of attacks in space. We are changing our investments and operations, and increasing our partnering with commercial entities and allies. More importantly, we are changing attitudes by recognizing that space is a warfighting domain and preparing ourselves to deter conflict in space and prevail if deterrence fails.

Finally, I want to recognize this committee's priority on strengthening national security space organization, management, and leadership. This question has the attention of the Secretary and Deputy Secretary of Defense. They expect to be presented with sound analysis and a full range of options, and they mean for us to meet the deadline of reporting to Congress this June.

In conclusion, I want to thank this committee for keeping the challenges of securing space before the public. I look forward to working together to ensure that we have the right strategy and resources, and the necessary programs, posture, and organizational structures to sustain deterrence, to prevail if deterrence fails, and to increase the incentives nations have to settling their differences by peaceful means. Thank you.

And I would add, as the person acting in the job that Mr. Kitay will be doing, nobody is happier to have him come in than I am. Thank you.

[The prepared statement of Mr. Hill can be found in the Appendix on page 79.]

Mr. ROGERS. I hear you. Thank you, Mr. Hill.

I recognize myself first for questions. This will be a question for anybody who is willing to swing at it. We passed a law about 10 years ago that directed how the Operationally Responsive Space [ORS] Office would be run. And I have heard instead of being streamlined, ORS options are still forced to go through the traditional Pentagon processes, including the Defense Space Council [DSC]. So rather than a small number of decisionmakers focused on moving fast with respect to operationally responsive requirements and acquisition, the recent decision meeting of the ORS program included over 60 attendees, with 54 more than we had envisioned. To me, this example is indicative of the extremely fragmented space organization and bureaucratic kudzu—my word—you have got to be from the south to know what kudzu is—that comes in and strangles out the life of the DOD space programs. It is a situation where everyone can say “no,” but no one can say “yes.”

So how do we fix that? General Raymond, swing first.

General RAYMOND. I will swing first. I am familiar with kudzu.

Mr. ROGERS. You are recognized.

General RAYMOND. Chairman, thanks for the question. Sixty people were not involved in that decision. As you stated, the ORS EXCOM [executive committee] law is pretty clear. There are six ORS EXCOM members by law. The PDSA [Principal DOD Space

Advisor] has the ability to designate others that are critical to that decision.

In this case, I wasn't in the room, but my understanding is that those six were the voting members, plus two or three others, that was it. It is under the framework of a larger DSC, but the decision-makers were the eight- or nine-person level, those were the voting members and the decision actually went pretty quick.

Mr. ROGERS. Well, I understand that there were six voting members, but weren't there 60 people in the room?

General RAYMOND. Yes, there were 60 people in the room, but there is also some goodness in transparency of having others there. They didn't vote, they didn't influence the decision, they were there. I will tell you, after those folks make that decision, a lot of those folks then have to be the ones that go execute that decision to make sure they have a common understanding. So it was a very small number of folks that was consistent with the legislation that was passed for a small, tight decision-making process for ORS EXCOM. And I am pretty comfortable that it was a pretty rapid decision.

Mr. ROGERS. So six people were the decisionmakers?

General RAYMOND. As I mentioned to you, there were six that were by law, and then there was a couple others that added by the—

Mr. ROGERS. So there were eight people?

General RAYMOND. I wasn't in the room, but it was small numbers.

Mr. ROGERS. Okay. Six to eight people?

Betty Sapp, do you have to have six to eight people to make decisions on acquisition process programs with your organization?

Ms. SAPP. I have at least two people to make decisions, one on the IC side and one on the DOD side. There are a lot of people, as you mentioned, who review the package of documentation for sufficiency before it gets to those decisionmakers. And, again, there is a whole lot of staff on the IC side, there is a whole lot of staff on the DOD side. So a lot of people look at it before it even gets on the calendar for the decisionmakers.

Mr. ROGERS. The people that look at it, do they have the authority to stop it or say no?

Ms. SAPP. Yeah, the authority to stall it.

Mr. ROGERS. Is that the case with the ORS, General Raymond? Those other people, can they slow it down or stop it?

General RAYMOND. My understanding is they do not have a vote in that process. They have the—as by law, the—

Mr. ROGERS. How about the lead-up process to get to that room, before it gets to that room for decisionmaking.

General RAYMOND. The PDSA schedules the Defense Space Council, and it is done relatively routinely, and it was done pretty quickly in this process. I didn't sense a slowdown on this.

Mr. ROGERS. Anybody else want a swing at it? All right.

Mr. HILL. Chairman, I will give you a comment as one of those nonvoting people who was in the room.

Mr. ROGERS. Okay.

Mr. HILL. What the Principal DOD Space Advisor also did was, she used that to tee up a decision that is also necessary, which is

the long-term solution for weather—so ORS is an important gap in the ORS program that was before us. An important gap [inaudible] that General Hyten had put forward and had been brought in the Air Force. That went pretty quickly. The discussion also then said to everybody are we also moving on the requirements process for the longer term, which she used that effectively in that respect.

Mr. ROGERS. Great. In the testimony to the SASC [Senate Armed Services Committee] earlier this week, General Goldfein talked about the need to integrate space. The Joint Staff is who is responsible for overall space integration forces. On that Joint Staff, there are 11 Air Force general officers. Of those 11 general officers, how many space professionals are included? Anybody want to guess? It would be zero. Do you know how many are pilots? That would be nine. If we look at the specific combatant command, according to EUCOM [U.S. European Command] there are over 28,000 Air Force personnel supporting EUCOM. And how many of those 28,000 are dedicated to work space issues? That would be two.

We do need to integrate space. I completely agree with General Goldfein on that with the air, and our land and sea, and cyber obligations. It is what combatant commanders do. But they are also designed to fight and win wars in a joint manner.

So General Buck, how do we integrate space capabilities better into our war plans and combatant commands? To me, that starts with people, and I am interested in your perspective.

General BUCK. Thank you. I agree with you. I would like to get more space officers, general officers on the Joint Staff. But the chief's very focused on developing joint officers, and I think that is a focus area for us as well. When we look across the enterprise, you look at United States Strategic Command, we have two space officers working in joint jobs at U.S. Strategic Command. I am in a joint billet myself as commander of JFCC Space.

The way we—I serve as—my JSpOC [Joint Space] Operations Center at Vandenberg, serves as space coordinating authority for the combatant command, so they have reach-back authority back to get those space effects out to theater.

As far as developing joint operations, General Raymond, I think we are doing a pretty good job, and that is a focus area as we go forward.

General RAYMOND. I would say, Chairman Rogers, you bring up a great point. The challenges that we face as a Nation today are transregional, if not global, multidomain and multifunctional. They are not confined to a line on the map. It is not just one geographic commander's responsibility; it is pretty much all the combatant commanders' responsibility. Each combatant commander has what is called a coordinating authority for space. Each of those combatant commanders has delegated that authority down to the CFACCs [combined force air component commanders], or the air component of that. In the air components around the globe, we probably have a senior space officer called the director of space forces. We have—and General Goldfein testified to this. He was the space coordinating authority at CENTCOM [U.S. Central Command] at the time. We have a senior space officer called the director of space forces. He has a staff of about five. And then in every single divi-

sion in the AOC [air operations center], we have space professionals embedded in those divisions.

So what we have done is prioritized putting the weight of effort in those AOCs where the combatant commander has designated that authority, too. And that is where we do that multidomain integration work, that is the hub of that multidomain integration work.

Mr. ROGERS. You mentioned that General Goldfein, at one time, was the space advisor?

General RAYMOND. No, sir, he was the CFACC, the Air Force's component commander for CENTCOM. And in that role, the CENTCOM commander delegates to him the authority called the space coordinating authority. And his AOC, where he operated out of, is that multidomain center that integrates air, space, and cyber into that fight, and that is where we focus a significant portion of our space operations.

Mr. ROGERS. General Buck, you were going to say something.

General BUCK. I am sorry to interrupt. I will say that probably in CENTCOM, we have the preponderance of space officers in CENTCOM right now. That is our weight of effort.

And if you look at CENTCOM right now, in the director of space force office we probably have 8, maybe 10 space officers in the director of space force offices there. But what is a real win for us, when not just we have a director of space force office there, but when we embed space officers in ISRD [intelligence, surveillance, and reconnaissance division] and COD [combat operations division] and CPD [combat planning division], that is a win; when we start not being an add-on, but we are baked into the processes over there. And I think we are doing better. Our focus right now is on CENTCOM, but I will tell you, sir, we are getting better in PACOM [U.S. Pacific Command] and EUCOM across the board.

Mr. ROGERS. Great. The chair recognizes the ranking member for any questions he may have.

Mr. COOPER. Thank you, Mr. Chairman. I would like to focus in my questioning on how crowded space is and how it is going to get a lot more crowded. Mr. Cardillo mentioned in his testimony on page 5 that in the last 10 years, we saw something like 1,500 satellites go up, but in the next 10 years, something like 9,000. That is 2½ satellites a day going up in space. That is amazing. But we have seen launches like in India recently that they put up 100 sats [satellites] just in one launch. So as space gets more crowded, it gets more treacherous. General Buck mentioned in his testimony, it used to be that the main threat we faced was debris; now we face traffic, we may face threats. So I am particularly interested in this idea of the nonmilitary space traffic management. Again, I understand, General Raymond, you embarked on a pilot program with the FAA [Federal Aviation Administration] on that?

General RAYMOND. Thank you, Ranking Member Cooper. We have. As I testified before to this panel, I share your concern; space is clearly congested and contested, but in this case, on the congested side. General Buck and his team track 23,000 objects a day, take about 400,000 observations a day to keep track of all that, act as the space traffic control for the world and keeps the domain safe for all.

It is very important, and I think General Buck will agree with me, I will pass it to him here, but it is very important, for national security purposes, that we have the ability to have radars, to task those radars, to collect the data for those radars, to be able to maintain the awareness that we need for that domain. However, I don't think we need to be the organization that makes the notifications around the world and acts as the traffic cop.

So I have met with the FAA administrator a couple months ago, and asked if he would join us in developing a pilot program, if you will, to see if we could inform this going forward. General Buck has the lead on pulling that together. And, David, if you want to give an update on where we are.

General BUCK. Thank you, General Raymond.

I am really proud of the team and how far we have come with the FAA. I have talked to Dr. Nield directly, and we have agreed jointly to begin that pilot program. I expect that pilot program to begin this summer, probably August timeframe.

I do agree with General Raymond, there are some aspects of the space traffic management that are not military, inherently military. And we could load-shed them to a civil agency. Things—safety of flight, debris management, norms of behavior. I don't think those are inherently military. I think it is important to make a distinction, too, between what is space traffic management and what is space situational awareness. For me, as a warfighter, I need space situational awareness; I need to know what an object is, where it is going, what its capabilities are, what its vulnerabilities are, those types of things.

What I don't need to be doing, I don't think, are things like notifications for conjunction assessment and norms of behavior. And I think that is better suited for a civil agency, and I think that is where we are going, sir.

Mr. COOPER. Let me add some color to your remarks. General Raymond said in a very calm fashion, we keep space safe, or something like that. We are protecting other countries' \$1 billion satellites from a piece of shrapnel that might be traveling at 33,000 miles an hour, but could destroy the machine, and for that, we get not even a thank-you note. You know, it is kind of amazing that we provide this magnificent worldwide service and little appreciation. Plus, as you said, when we consider load-shedding, it is a burden on our folks that doesn't necessarily need to be borne by them.

General RAYMOND. Other people—not all countries—some countries do send us thank-you notes, do talk a lot more to us, others don't. We are really doing it because we want to keep the space domain safe for all to use, including us. And so that is the emphasis behind that. We need to be able to operate in space, and it is our way of helping to make sure that we can do that.

Mr. COOPER. But it is also an essential truth-telling function. Like, if you look at the downing of the Malaysian airliner over the Ukraine, there was worldwide debate and dispute over what caused that plane to crash. And even though we have excellent air traffic control in most parts of the world, there was still a significant dispute. And when it comes to separating news from fake news and propaganda, you know, I think in the space domain, it would be nice if we established a sort of gold standard of truth so

we would know if it was debris, we would know if it was something less benign than that. So I am worried that while I hope the pilot program gets off to a good start this summer, I hope it will soon be able to establish a standard, but even with air traffic, we are having difficulty isolating causes when it should be, with all of our plane radars and things like that, an easier thing to prove than it is in space. So I hope we will get on that task.

Thank you, Mr. Chairman.

Mr. ROGERS. The chair now recognizes Mr. Lamborn for any questions he may have.

Mr. LAMBORN. I thank you, Mr. Chairman. And thank you all for the great service that you provide for our country. And General Raymond, I am going to follow up on a question we touched on in our conversation yesterday. With BMC2 [battle management command and control], I remain concerned about the prospect of repeating the same mistakes we made with JMS [Joint Space Operations Center Mission System], whereby lab prototypes and custom government development efforts were prioritized over utilizing proven commercial capabilities, which, unfortunately, led to huge scheduling and cost overruns. Can I get your commitment that you will prioritize the utilization of commercial capabilities to the maximum extent practicable first, and then fill in with government development for the truly unique military requirements that don't reside in the commercial marketplace?

General RAYMOND. I am a big proponent of commercial data. I have said for many years in front of this committee that we need all sources of data. We need data from commercial, all the way up to the high-end intelligence data. And on what our strategy going forward on the battle management command and control system that you reference is to do just that, is to use commercial companies in a consortium to help us develop those requirements.

It is analogous to the iPhone. You've got the iPhone and then you have apps. And we want to have open standards and open consortium so all players can play in feeding us that data and to do so quickly. We have to get it on the floor. We have to get it in the National Space Defense Center as quick as we possibly can.

Therefore, what we did was, we switched the program, and I gave that to the Air Force Rapid Capabilities Office, who has already done this. They have already taken the capability, built an open-architected system, has a consortium approach, and it has worked very well. So we are fast-forwarding this capability by giving it to the folks that can move rapidly, that have already done it in another capability in the air domain. And what this will allow us to do is also get at that multidomain integration.

So the whole purpose of this program going forward is to enable a lot of commercial data and other source data to be integrated to give General Buck the data that he needs to have to do the mission that he is responsible for.

General BUCK. If I could just make a comment along the same lines. Ranking Member Cooper stressed the importance of domain awareness. It is really important that we ingest non-traditional data into our space surveillance network as well. That is a hard thing to do, but we are making progress. And I think this summer some time, we are going to bring out a capability called the non-

traditional data preprocessor that will begin to allow ingestion of commercial data into our space surveillance network. So I think that is a move in the right direction for domain awareness and non-traditional ingestion, like commercial sensors, if you will.

Mr. LAMBORN. Thank you both.

Changing gears, I have heard some rumors about insufficient funding for GPS [Global Positioning System] III in the fiscal year 2018 request. What are we doing to keep this important program on track?

General RAYMOND. So Congressman, we have not submitted the 2018 budget going forward. We have, in my opinion, a pretty healthy GPS constellation in that we have got 31 operational satellites on orbit. We actually have 37 on orbit, 31 are operational. We are moving forward with the [GPS] OCX [Next Generation Operational Control System] program. Although that, as many folks have testified previously, would not be the model program that we would hold up as the standard. And we are clearly not out of the woods yet. And I won't be comfortable until that capability is operational on the OPS [operations] floor for General Buck's team to be able to operate.

So I am pretty comfortable where we are with a relatively healthy GPS constellation that is on orbit and progress being made on the ground control—

Mr. LAMBORN. What does that mean for the budget for next year?

General RAYMOND. The budget is going to be released next week. And so, I would prefer not to speculate on what might be released in the budget until that gets released.

Mr. LAMBORN. Okay. Ms. Sapp, in 40 seconds, I am going to give you a huge question, but you referred to how we don't have the commitment we need for space going forward. What can we do better as a country to show that commitment and that resolve?

Ms. SAPP. I think we really need help on the budget side, not just investment in space, but the ability to use the investment. As we are fielding new things to improve our resiliency, it was very hard to move ahead with new things under our continuing resolution. It is not allowed. So that is just slowing the pace of progress, even after we get it out of the executive branch, which is no mean feat. So you could help a lot on that front.

Mr. LAMBORN. Thank you so much.

General RAYMOND. I would echo that as well on behalf of Air Force Space Command.

Mr. LAMBORN. Thank you.

Mr. ROGERS. The chair now recognizes the gentleman from California, Mr. Garamendi, for any questions he may have.

Mr. GARAMENDI. I am going to forego the usual GPS backup. I assume that is moving along, and if not, there will be a piece of legislation that will move it along perhaps even faster.

Not exactly sure how far to go with this. I represent Beale Air Force Base. There are certain activities going on, I am not sure we should be talking about them here. But I would like to take that up, because I think it integrates with most of what is being discussed here.

Just in general, the integration of information from a variety of sources, I think this is something that is happening just in general. Your views on that progress?

General RAYMOND. In general, I think it is going really well. And in fact, as largely the model that I use to make the decision to go with the approach that we talked about in the battle management command and control conversation we just had with Congressman Lamborn. I would be more than happy to talk more in the closed session with you.

Mr. GARAMENDI. I think I will let it go at that point. Oh, no, I have one more. We picked this up yesterday in going on—a plan for the next decade of critical assets that need to be developed and deployed, and the approximate cost of those. I think we need to have a long-term vision here about where we are going to deploy perhaps the most essential asset of all, which is our financial resources. I have not seen such a display of those things that we—that you, the military in general, and certainly the Air Force specifically in the space area, need, want, must have. I think it is really essential that we look at that. There will be insufficient money for everything, particularly if the tax cuts are real.

And, so, we are going to need to make some tough decisions about prioritization, and that means the long view, 10 years minimum, so that we can say, Okay, these things will be funded, those are not, or we are going to fund all of it and not fund something else. So Mr. Chairman, if we could move in that direction so we can have that long-term vision.

General RAYMOND. Could I—I would welcome an opportunity to come back to you and walk you through the Space Enterprise Vision. That is our longer-term vision for space. It is done in very close partnership, it is an integrated vision with the NRO. I want to take a moment—I do this every time I can, and I am not saying it because Betty Sapp is here—Betty Sapp is a huge partner for us.

Mr. GARAMENDI. Two minutes, eight seconds. Go for it.

General RAYMOND. But I would be more than welcome to come back and walk you through that vision, walk you through the priorities as we see them and inform you on that.

Mr. GARAMENDI. We heard some of this yesterday from General Goldfein about different directions, or at least a different set of priorities for the future. Much of it involved your work, so I wanted to get a fix on that and other things that we may not, but is a priority. Thank you for that.

I didn't mean to cut you off, I really meant you had 2 minutes and 8 seconds to answer.

General RAYMOND. No, I didn't want to take your time. I wanted to see if you had more questions.

Mr. GARAMENDI. Thank you.

Mr. ROGERS. The chair recognizes Mr. Bridenstine for 5 minutes.

Mr. BRIDENSTINE. Thank you, Mr. Chairman. When you think about the consortium, General Raymond, that you talked about for the BMC2 piece of the National Space Defense Center. That consortium, of course, is trying to rapidly develop a capability where we are currently maybe lagging behind. And, of course, I think everybody on this committee fully supports that effort.

In the meantime, is there an SSA [space situational awareness] gap that needs to be filled that could be—commercial could help with? And maybe General Buck, if you would like to answer that as well.

General BUCK. Well, thank you, sir. Good seeing you again.

Mr. BRIDENSTINE. Always.

General BUCK. I mentioned a non-traditional data preprocessor. I think that is a step in the right direction. I think you will agree with me, the ability to ingest some of those non-tradi—that helps. What also we have is, we have SBSS [Space Based Space Surveillance] that is online—on orbit right now, that is being extended. The life on that is extended past its—I think the dates are classified, but that is going to be extended, and plus ORS-5 [Operationally Responsive Space 5] gives us, provides us that gap-filler capability as well. So I think those three things together give us the capability to fulfill that gap.

General RAYMOND. Just as a general statement, more data is better, from a South Carolina kudzu guy. More data is better. We need data across the full spectrum, and we do get that across the full spectrum. The other thing that we have done is develop partnerships, and we have got—don't quote me on the numbers—over 50 or 60 SSA sharing agreements with partners. It is largely one-way sharing, but there are two-way sharing pieces. I would like to make that stronger. When we get the new JMS system up with more capacity and more ability to ingest that data, that will take off. But more is better.

Mr. BRIDENSTINE. More is better. I would like to maybe continue on what Ranking Member Cooper was talking about, this effort to create a partnership with the FAA for space situational awareness specifically. Can you share with us how that is being funded? And is it coming out of your budget? Is it coming out of their budget? Is there something Congress should do here to help?

General BUCK. My understanding is there is going to be a fiscal year 2018 budget request coming out of the FAA. But I am hesitant to say that because I am getting in the FAA's lane a little bit. But I think there is a funding request for 2018 that is coming out of the FAA, sir, but I don't have the specifics on that.

Mr. BRIDENSTINE. That is good to hear. Again, I know that is not your lane. I don't want to get you in trouble, but I think this committee would be very supportive of that partnership. Right now, we have heard testimony over and over again how we are providing free situational awareness to the entire world, and to all the commercial partners, and at the same time, the tasking that it has imposed on our warfighters at the JSpOC has been problematic, to the extent I hear this from other Members of Congress that they want to—and I heard you use the word “load-shed”—they want to load-shed the mission, but they do not want to load-shed the funding. And I want everybody on this committee to know, the Air Force was never funded to provide space situational awareness to the entire world and commercial operators for free. That has not ever been in your mission description. And yet, that is what you are doing by default out of goodness of your hearts. I say the goodness out of your hearts, but the reality is we need to protect our own assets, and we all know that.

So I just want to reiterate the fact that if we can create a space situational awareness environment that can be led by a civilian agency and free your manpower to actually be focused on fighting and winning wars, I think everybody on this panel would fully support that effort. And if we need to do an appropriation, I think that that is something we should be advocating for. So with that—go ahead.

General RAYMOND. I agree with everything you said. I just also want to make sure that we state the criticality that the national security space mission needs to make sure that they have the space situational awareness.

Mr. BRIDENSTINE. Absolutely.

General RAYMOND. So I agree with you that there is a role here for others, but it is critical to our national security that we also maintain the capability to have that awareness.

Mr. BRIDENSTINE. One hundred percent, Air Force must and will always do space situational awareness, and, of course, space defense; I 100 percent agree with that. It is the—not just the conjunctive analysis, but it is the warning that takes a lot of the manpower away from your—

General RAYMOND. I am with you.

Mr. BRIDENSTINE. Okay. All right. With that, Mr. Chairman, I yield back.

Mr. ROGERS. I thank the gentleman. The chair now recognizes the gentleman from Washington State, Mr. Larsen, for 5 minutes.

Mr. LARSEN. Thanks, Mr. Chairman. I was going to jump in on this, but given that I am the ranking member of the Aviation Subcommittee on Transportation, and we are writing an FAA bill, I guess would be reluctant to have the satellite-tragedy-to-be tracking dumped on the FAA as well. And you are not saying that is happening, General Buck, you are not saying that. I am more concerned that Congress gets out over the tips of its skis on this and assigns it without money or help; rather, negotiating out a solution is a better idea. I think it is probably a better place for it, in fact. But one question I am sure the FAA would have, I would have as the ranking member is, What advantage does the FAA—what can it get from it from actually doing the activity as opposed to just another set of activities?

General BUCK. My discussions with Dr. Nield and his staff is that they see this as a real opportunity to do things that are more like air, air-centric, establishing norms of behavior, establish patterns for safety of flight in space. So they—not to speak for FAA, but my conversations with them have led me to believe that there is goodness, they see some goodness in this and they are anxious to take on specific aspects of the space traffic management mission.

Mr. LARSEN. Yes, that is great. I look forward to hearing from Dr. Nield and from you at some point. I will talk to staff here about getting you all together to discuss this, so we have, I wouldn't call it adult oversight on this, I would never accuse us of doing that sometimes, but certainly some oversight. There is a lot of debate going on right now in the FAA about reorganizing it overall. And tossing this into the mix is—it is going to get done, putting that in context of all the other things we are trying to do at the FAA is important. That is my main point. Thanks a lot. I yield back.

Mr. ROGERS. I thank the gentleman. The chair recognizes the gentleman from Colorado, Mr. Coffman, for 5 minutes.

Mr. COFFMAN. Thank you, Mr. Chairman.

General Raymond, the Air Force has specifically expressed that rocket system development is a better way to maintain our dominance in space. Therefore, is it still the Air Force's approach to fund a rocket system versus only rocket components? Would you tell us how you see the government collaborating with industry in funding the rocket system development. What is your vision of how industry should meet the Air Force's evaluation criteria?

General RAYMOND. Thank you for the question.

The Air Force's strategy remains threefold. First of all, it is critical that we have assured access to space. You have to have that. The second component is that we would like to support competition. We see the benefits of competition in the launch industry. And the third aspect of that is we would like to get off the RD-180 engine. That strategy remains the same. We are investing in launch services. We don't procure rockets, we procure launch services and that strategy remains the same and is on track.

Mr. COFFMAN. Thank you, General. General Raymond, I understand that price is an important consideration in any procurement effort, but in my experience, other factors are also important. Given the cost of many of the payloads and how essential they are to our national security, can you discuss how the Air Force evaluates and includes, in its procurement decisions, qualitative items such as reliability or maintaining the industrial base?

General RAYMOND. All that comes into play, it is not just cost based; it is a full-spectrum analysis. There is a pretty high bar that we go through for certification. We would not put on contract a launch if we didn't think that that was going to be assured to get on to space. It is a full range, and it is mission by mission; some missions are more complex than others.

Mr. COFFMAN. Okay. Anybody on this could answer this. It is my understanding that the Space Based Infrared System, SBIRS, is the current and primary method to detect ballistic missile defense threats, and we are dependent on SBIRS; we have been dependent on SBIRS since the 1970s. Are there other systems envisioned to complement SBIRS? That may be for the classified brief. How robust are those other systems that supplement SBIRS? How vital is Buckley Air Force Base and SBIRS to our space mission?

General RAYMOND. Let me just say SBIRS is a national security priority. It provides strategic missile warning for our Nation. It is probably one of the most critical systems that we operate. The wing up at Buckley, the 460th Space Wing led by Colonel Dave Miller is a premier organization. It is extremely critical to the success of that mission area.

I was just up there a month or so ago and they are doing great work. I would—as we look to the future, we look to make the constellations more resilient. And I would have further conversations with you in the closed session to get into more specifics.

Mr. COFFMAN. General Buck, in your testimony, you reference a transition of training our satellite officers from a technician-based focus to a warfighter-based focus. I think this depicts the increasing counterspace efforts of our adversaries and the threats they

pose to our national security. Would you go into detail regarding the training to counter these threats, and the transition to a war-fighter focus?

General BUCK. What I was referring to was the Space Mission Force construct that we have implemented in the wings. The 50th Space Wing is complete with a Space Mission Force transition. Currently the 21st Space Wing and the 50th Space Wing are undergoing the same transformation.

What this does in the Space Mission Force construct for 4 months at a time, we have space crews that are in the fight, they are focused on the current fight, while the other portion of the crew force at these wings are focused on advanced training, tactics, techniques, and procedure development for the future fight, and how they can codify those into their doctrine. So that is what I was referring to. And I am really proud of the progress they have made and the way ahead and General Raymond, some of that is in your OT&E [organize, train, and equip] lane.

General RAYMOND. I would also add, it is broader than just space for space sake. So we are also integrating our space operators into joint exercises, into exercises called Red Flag, into war games that are joint and international. We just developed a Space Flag construct. So it is developing depth of space expertise, but then also working the multidomain integration piece, because this isn't space for space sake. This is integrating airspace and cyber for the goodness of our Nation and we are tackling both portions.

Mr. COFFMAN. Thank you. Mr. Chairman, I yield back.

Mr. ROGERS. I thank the gentleman. The chair now recognizes the gentlelady from Hawaii, Ms. Hanabusa, for 5 minutes.

Ms. HANABUSA. Thank you, Mr. Chairman.

General Raymond, I have got to admit, when I see Air Force, I have been thinking about missile defense as well as your role in the triad system. And reading your testimony, it has raised a different set of questions for me. First of all, what I couldn't get past was this one paragraph, and if you could explain this to me, in your testimony at page 3, you talk about the first 7 months of your command, you aggressively pushed implementation of the—basically of the AFSPC [Air Force Space Command], and the National Reconnaissance—NRO Space Enterprise Vision with a new space warfighting construct. The warfighting construct is the framework for turning the Space Enterprise Vision into reality. What I am interested in is what is this warfighting construct that you are talking about in terms of space?

General RAYMOND. Thank you, and it is nice to meet you.

Ms. HANABUSA. It is nice to meet you.

General RAYMOND. The Space Enterprise Vision is, as I mentioned earlier, is the vision that is a shared vision between us and the National Reconnaissance Office. And I will pass this over to Betty Sapp as well, but it is the shared vision for moving forward on how do you make the domain—our architectures more resilient to be able to survive the contested domain that we find today. The warfighting construct really talks about several things that we have talked about this morning. It takes that vision and builds a CONOPS [concept of operations]. How do we plan to operate together? And so that is the foundation of this. We have worked very

closely with the NRO to develop that CONOP, so we know how we are going to work together.

There is another layer, that is also the part that we just talked about on developing and training our forces; the Space Mission Force construct is part of that. There is another layer on it, is how do you develop the partnerships that we need, both interagency with our commercial partners and with our allies, to be able to respond to the strategic environment that we face today.

Ms. HANABUSA. Before you pass me on, let me explain to you why, why my curiosity. Because in Mr. Hill's testimony—maybe I will bypass Ms. Sapp. No offense. But to ask and take it to Mr. Hill is, his testimony speaks about the, quote/unquote, our threats that we hear about all the time in here, Russia and China. He also speaks about A2/AD and the concerns that we have.

And he says, "Both will continue to pursue a full range of anti-satellite weapons as a means to reduce U.S. military effectiveness." So what I thought you were going to tell me about the war construct was that it was in line of that—in other words, where we think about the oceans, the land, and so forth, this is another layer of, quote, war that we must be ready to fight.

And I, quite candidly, I am not sure when you have Russia and China, they can undermine everything in terms of diplomatic—this nice kind of cooperation that we are all talking about here. I really would like to know, to the extent that you can tell me here today, what exactly does this all mean in terms of our military, and what do you need, when you come to see us, in order to fight that battle?

General RAYMOND. First of all, we don't talk about a war in space. We talk about a war that extends into space. We are not—this isn't space for space sake.

Ms. HANABUSA. Is that something that is unrealistic? I mean, is it conceivable that we could actually have, quote, "war in space"? In other words, could our satellites be the first target? Because once you take out our satellites, you have basically destroyed our effective communication mechanism, so could they not be a first line of offense against us?

General RAYMOND. If you look at what some of our potential adversaries are talking about, they are talking about a full range of capabilities that range everywhere from reversible jamming of communication and GPS satellites like we have seen, all the way up to the direct ascent ASAT [antisatellite weapon] that we saw from China in 2007.

Our posture is, we want to deter that. We have no interest in fighting that fight, and as I said, one way to do that is be prepared for it. The space warfighting construct develops the partnerships, the plans, the concept of operations, the training needed to be able to respond.

Ms. HANABUSA. In the minutes, seconds that I have left, Mr. Hill, would you like to comment on it, because it is your testimony that triggered my line of—

Mr. HILL. Certainly. And I say in my testimony, there is scant evidence that anybody is looking for a war in space. It is about the terrestrial issues that they have, political differences that countries have, and it is their conclusion that if they want a military option,

they have to be able to act in space as well. And as you are suggesting, that could be early.

Ms. HANABUSA. Thank you, Mr. Chair, I yield back.

Mr. ROGERS. I thank the gentlelady. The chair now recognizes the gentleman from Arizona, Mr. Franks, for 5 minutes.

Mr. FRANKS. Well, thank you, Mr. Chairman, and thank all of you for being here and for just all you do for the cause of human freedom.

General Raymond, just a quick, direct question. Do you believe it is fair to say that space has been weaponized?

General RAYMOND. I believe it is fair to say that space is a contested domain just like—and it is a warfighting domain just like air, land, and sea.

Mr. FRANKS. Do you believe we need a more robust defensive space sensor layer to adequately identify the latest in emerging threats to our space assets?

General RAYMOND. I think it is imperative that we have a level of domain awareness that is required to operate just like in any other warfighting domain.

Mr. FRANKS. Should this U.S. space—should we treat space as a warfighting domain?

General RAYMOND. Space is a warfighting domain just like air, land, and sea, and we need to treat it that way.

Mr. FRANKS. Yeah. Should the U.S. develop defensive capabilities to counter kinetic attacks against our space security architecture?

General RAYMOND. It is an imperative, in my opinion, that we develop resilient architectures to be able to operate in the contested environment that we face today.

Mr. FRANKS. General Buck, do you have any thoughts on that?

General BUCK. Space is a warfighting domain, and if you look at the other domains, air, land, sea, they have defensive capabilities. They have other capabilities. We can't afford to treat space any differently.

Mr. FRANKS. Is it fair to say that some of our near-peer adversaries' offensive space capabilities have outpaced our ability to defend our space assets? And I might ask the two of you.

General RAYMOND. I would like to have that conversation in closed.

Mr. FRANKS. I got you. Makes sense.

All right. Do you see—and I will throw this out to the entire panel. Do you see value in establishing an annual capstone training exercise, sort of the equivalence of the Red Flag, only, say, a Space Flag event for space operators?

General BUCK. We have had our first Space Flag this year. Although it is nascent, we are having the conversation, and we are moving in the right direction. I see this first Space Flag as the first of many to follow. General Raymond.

General RAYMOND. I agree.

Mr. FRANKS. I sometimes—

General RAYMOND. As I mentioned earlier, that is important, but there is the other aspect of it that it has got to be, how do you integrate air, space, and cyber together, and how do you integrate it with not just air, space, and cyber, but with the land and the sea,

and so there is other opportunities, in addition to Space Flag, that provides that capability as well.

General BUCK. And those are space-specific Schriever War Games. Those are the global series, on and on. The JSpOC and the NSDC [National Space Defense Center] participated in north of 70 exercises last year, integrating space into the larger fight, so I am really proud of that effort.

Mr. FRANKS. Mr. Chairman, I think I will probably leave the rest of my questions for the classified session. I thank all of you so much. And thank you, Mr. Chairman.

Mr. ROGERS. I thank the gentleman. The gentleman from California, Mr. Carbajal, is recognized for 5 minutes.

Mr. CARBAJAL. Thank you, Mr. Chairman, and thank you to all of you for being here today.

I represent Vandenberg Air Force Base, and recently had the great privilege of joining General Buck on a tour of the facility, the JSpOC facility in addition to other facilities there. I guess, for my colleagues and just for me to—for it to sink in, you could never hear it enough, could you share, General Buck, the contribution of the Vandenberg Air Force Base JSpOC to our national space strategy and capability, and perhaps close with how that relates, or what the nexus is to the new JSpOC in Colorado?

General BUCK. Thank you, sir. Good seeing you again.

We have two primary command and control centers. At Vandenberg Air Force Base, we have the Joint Space Operations Center. In this operation center, we have our commercial partners on the OPS [operations] floor, we have our allied partners, FVEY<sup>†</sup> partners on the OPS floor. They are doing the day-to-day, heavy lifting support to the terrestrial fight.

When a combatant commander needs space support, space effects, they go to the JSpOC, and they provide military satellite communications, precision navigation and timing, all those space effects, and they do it better than anybody else.

The National Space Defense Center located at Schriever Air Force Base is responsible for looking up, protecting the space joint operating area, if you will. So JSpOC at Vandenberg in the current fight right now, support to the terrestrial fight; the National Space Defense Center at Schriever Air Force Base in Colorado, responsible for protecting and defending the space joint operating environment.

General RAYMOND. And I would pile on today that JSpOC is the operational DOD space command and control facility, period, dot, and they do spectacular work. I have had the privilege of being stationed at Vandenberg four times. Second Lieutenant Jay Raymond showed up there in 1984, and they are absolutely wonderful airmen and joint—not just airmen, but joint partners that keep that domain safe for all, provide a critical capability to all of the warfighters around the globe, and is the only operational DOD space center that we have today.

Mr. CARBAJAL. Well, it was extremely impressive, and I just want to thank General Buck for his being so hospitable and giving

<sup>†</sup>FVEY is the abbreviation for “Five-Eyes,” an intelligence alliance involving Australia, Canada, New Zealand, the United Kingdom, and the United States.

me an opportunity to interface with many of the troops and many of your command team there. It was a great visit, it was a great learning opportunity, and I just really appreciate what you do.

General BUCK. Sir, it is our pleasure. Thank you for joining us, sir.

Mr. ROGERS. I thank the gentleman. The chair would like to ask a few more questions before we go into closed session. Talk a little bit about launch.

General Raymond, how long do you plan to maintain the Delta IV, and I would like for you to differentiate between Delta IV Medium versus Delta IV Heavy, and do you plan to keep the Delta IV Heavy specifically until a new launch vehicle is certified, and if so, how?

General RAYMOND. Yeah. There is three Delta IV Mediums that are left. The final launch for the Delta IV Medium is scheduled in fiscal year 2019. We have seven more Delta IV Heavies. Six of those are national security space launches; one of those is a NASA [National Aeronautics and Space Administration] launch, and there is an option for one more. Final launch will be in fiscal year 2023, and we are comfortable that we will have a new capability on line to be able to support the requirements going forward.

Mr. ROGERS. You just heard, Ms. Sapp, him make reference to the national security payloads. How important is it to your mission to have the Delta IV Heavy or an equivalent available?

Ms. SAPP. It is essential to my mission that they are available in the near term. I tell you, General Raymond has mentioned the partnership between us in the NSDC and in operations. We couldn't have better launch partners than we do in the Air Force. They have taken care of our mission. We buy on their contracts. They made sure we had Delta IV Heavy coverage with a lot of transition margin to get to a new booster, so we have just been very satisfied with their support.

Mr. ROGERS. You heard General Raymond say that he believes that by 2023, we will have a replacement certified. I hope so, too, but if we don't, do you believe that we should let the Delta IV Heavy go before we have an alternative certified?

Ms. SAPP. I believe we have time to see how the new programs mature before we cannot go back on the Delta IV Heavy. I wouldn't carry it in the near term. Again, we have got them funded through launches in 2023, so we have some time here to make the right decision for the Nation.

Mr. ROGERS. That was a lawyerly response. As a lawyer, I appreciate that.

Separately, General Raymond, since the Air Force originally developed its strategy to invest in the development of commercially viable launch vehicles, there has been another new entrant in the commercial launch market. Earlier this year, Blue Origin announced it has started to get commercial customers for their New Glenn launch vehicle, and maybe they will even compete for the launch service agreement funding.

Has this changed your strategy, and do you think that government's role—it is the government's role to build a new commercial launch vehicle if they are already being built by the commercial sector?

General RAYMOND. Chairman Rogers, it doesn't affect our strategy at all. Our strategy remains three things, as I mentioned: assured access to space, competition, and get off the RD-180 engine. Our acquisition strategy is flexible and it encourages multiple competitors for national security launch services. I don't see it affecting it at all, and we are not building commercial launch vehicles.

Mr. ROGERS. What do you know about the BE-4's testing setback that we had in recent days? Was its powerpack completely destroyed, and how does this impact your schedule?

General RAYMOND. My understanding, Chairman, is that Blue Origin has announced that they conducted a test that resulted in the loss of a powerpack test hardware. Obviously, that mishap is regrettable, but it isn't unprecedented in the development of in—isn't uncommon in development efforts.

I think this adds credibility to our strategy to make sure that there is multiple engines being developed. I think we have visibility, pretty significant visibility into ULA's [United Launch Alliance's] processes, although it is ULA's final ultimate decision, and then once that decision is made, obviously, the Air Force, as a significant customer of that launch service, will do its own independent review.

Mr. ROGERS. Excellent. The chair now recognizes the ranking member for any final questions he may have.

Mr. COOPER. Thank you, Mr. Chairman.

General Raymond, in your testimony on page 12, you mention that GPS III SV01 has been completed and is in storage, with an initial launch capability date set to occur in spring 2018. That struck me as an unnecessary mothballing of a perfectly good satellite. Why the delay?

General RAYMOND. There is a couple of pieces that we are still working on. One, obviously, we are working on making sure we can command and control the GPS III satellite with OCS block phase zero, which will be up by then, and then also there is work to be done on—integration work to be done with the launch provider that will launch that satellite.

Mr. COOPER. Is this customary to have a year or more delay in launching a satellite?

General RAYMOND. There are satellites that have been in storage significantly longer than that. It is not unc customary. We will launch it when it is safe and ready to do so, and we can get it onto orbit, and then command and control it. And as I mentioned earlier today, earlier in the hearing, that today we have a pretty significant GPS constellation on orbit as we speak.

Mr. COOPER. So this is not an issue of assured access to space?

General RAYMOND. It is an issue of making sure that we can command and control that capability when it is on orbit, and then working the final details of being able to—for them to integrate with the launch vehicle provider that we will launch it.

Mr. COOPER. Okay. Thank you, Mr. Chairman.

Mr. ROGERS. I thank the ranking member. The committee will now go into a brief recess as we move to a secure location for the classified portion of this briefing.

[Whereupon, at 9:15 a.m., the subcommittee proceeded in closed session.]

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# **A P P E N D I X**

MAY 19, 2017

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**PREPARED STATEMENTS SUBMITTED FOR THE RECORD**

MAY 19, 2017

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**Opening Remarks**  
**Honorable Mike Rogers**  
**Chairman, Subcommittee on Strategic Forces**  
**House Armed Services Committee**  
**Hearing on Fiscal Year 2018 Priorities and Posture of the National**  
**Security Space Enterprise**  
**May 19, 2017**

Good morning, and welcome to the Strategic Forces Subcommittee's hearing on the Fiscal Year 2018 Priorities and Posture of the National Security Space Enterprise. We are honored to have a panel of expert witnesses who are leaders of our national security space program. The witnesses are:

General John "Jay" Raymond  
Commander, Air Force Space Command

Lieutenant General David Buck  
Commander, Joint Functional Component Command for Space

Mr. Robert Cardillo  
Director, National Geospatial-Intelligence Agency

Ms. Betty Sapp  
Director, National Reconnaissance Office, and

Mr. John Hill  
Acting Deputy Assistant Secretary of Defense for Space Policy

After we finish with the unclassified testimony and questions and answers, we will adjourn to a closed session to continue our oversight in an appropriately secure fashion.

In Secretary Mattis' confirmation hearing in front of the Senate earlier this year, he stated that "While our military maintains capable land, air, and sea forces, the cyber and space domains now demand an increasing share of our attention and investment". I fully agree with the Secretary's statement.

Our military and intelligence leaders have been clear in their warnings, some going back many years, that our use of space could be taken away from us in the next military conflict.

However we have not moved with conviction and urgency to respond to these warnings, and this has left us with a growing crisis to confront in outer space.

While I have the full faith and confidence in each of our expert witnesses here today, I do not have faith in the tangled bureaucratic structure they must work in.

Meanwhile, China is advancing rapidly in space and counterspace, and has even established a new military organization to focus its space, cyber, and electronic warfare capabilities.

As Dr. John Hamre, former Deputy Secretary of Defense eloquently stated in an earlier hearing to this committee, “We are not well organized to deal with the new challenges we face in space. The old structure may have been sufficient when space was an uncontested area of operations. That time has passed.”

Ladies and gentlemen, now is the least capable our adversaries will be in space, and now is the time for reform.

With that, I look forward to hearing all your perspectives on our space priorities and posture, and thank you all for being with us regarding this important topic.

I now recognize my friend and colleague from Tennessee, Ranking Member Jim Cooper, for his opening statement.

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SUBCOMMITTEE ON STRATEGIC FORCES  
HOUSE ARMED SERVICES COMMITTEE  
US HOUSE OF REPRESENTATIVES

DEPARTMENT OF THE AIR FORCE

PRESENTATION TO THE  
SUBCOMMITTEE ON STRATEGIC FORCES  
HOUSE ARMED SERVICES COMMITTEE  
US HOUSE OF REPRESENTATIVES

SUBJECT: Fiscal Year 2018 Priorities and Posture of the National Security Space Enterprise

STATEMENT OF: General John W. Raymond  
Commander, Air Force Space Command

May 19, 2017

NOT FOR PUBLICATION UNTIL RELEASED BY THE  
SUBCOMMITTEE ON STRATEGIC FORCES  
HOUSE ARMED SERVICES COMMITTEE  
US HOUSE OF REPRESENTATIVES

**INTRODUCTION**

Chairman Rogers, Ranking Member Cooper and distinguished Members of the Committee, thank you for the opportunity to appear before you in my capacity as the Commander of Air Force Space Command. It is my distinct privilege to lead and represent the nearly 36,000 dedicated men and women of Air Force Space Command (AFSPC) who serve at 134 locations around the world and provide foundational space and cyberspace capabilities vital to the protection of the Nation. The AFSPC mission remains to provide resilient and affordable space and cyberspace capabilities for the Joint Force and the Nation.

This year marks the 70<sup>th</sup> anniversary of our Air Force and the 35<sup>th</sup> anniversary of Air Force Space Command. Over that 35 year history AFSPC's contributions to our Air Force and the nation have been profound. Together with our Joint Force partners, Airmen have enabled and contributed to a fundamental transformation of the American way of war -- ensuring that our Air Force can always provide the United States with Global Vigilance, Global Reach, and Global Power. However, 26 years of continuous combat operations coupled with budget instability and lower-than-planned budget levels have placed great strain on the United States Air Force and Air Force Space Command. My comments today will focus on the space domain.

**SPACE IS A WARFIGHTING DOMAIN**

For decades the United States has enjoyed unimpeded freedom of action in the space domain. This has allowed us to deliver space capabilities that include intelligence collection, missile warning, weather monitoring, satellite communications and precise positioning, navigation and timing essential to U.S. Armed Forces that operate globally with unmatched speed, agility and lethality. These same capabilities also contribute to the many civil capabilities that impact our economy and improve our quality of life. These on-orbit space capabilities were

designed primarily to operate in an uncontested space environment void of adversary threats – a condition we no longer enjoy today. At present, our potential adversaries understand the competitive advantage we derive from space and view our reliance on space as a critical vulnerability they can exploit. As I have testified before, in the not too distant future, near-peer competitors will have the ability to hold every U.S. space asset in every orbital regime at risk. To meet this challenge, we need to embrace the fact that space is a warfighting domain just like the Air, Land, Cyberspace and Maritime domains, which requires that we address our vulnerabilities and maintain our resolve to ensure the peace.

To that end, my focus and priority as the Air Force Space Command Commander is to organize, train, and equip Air Force space forces to deter conflict from extending to space, but if deterrence fails to fight and win. In order to preserve the peace, we must posture with strength and should conflict occur, enable Combatant Commanders to seize the initiative and counter any potential adversary in support of U.S. national interests.

#### **SPACE WARFIGHTING CONSTRUCT**

In my first seven months of command, we have aggressively pushed implementation of the joint AFSPC/National Reconnaissance Office (NRO) Space Enterprise Vision with a new Space Warfighting Construct (SWC). This Warfighting Construct is the framework for turning the Space Enterprise Vision into reality.

The foundation of this construct is the development of concepts of operations (CONOPS). Working collaboratively with the NRO, the broader intelligence community, and United States Strategic Command, we are developing a series of CONOPS that document how we expect to achieve synchronized planning and integrated operations in order to protect and defend the national security space enterprise.

The Space Mission Force (SMF) is the human capital of the Space Warfighting Construct. I can't overstate just how powerful the SMF has been in helping us adapt a warfighting culture across the command. Our operations crews have made significant strides since the inception of the SMF and are now operating with a mindset tuned to the threat. By normalizing space training with the rest of the Air Force, our Airmen will be prepared to recognize and react to adversary threats. Today the 50th Space Wing and a portion of the 21st Space Wings have achieved initial operational capability (IOC). The remainder of the 21<sup>st</sup> and the 460<sup>th</sup> Space Wings will achieve IOC on 1 October 2017.

We have a near term national imperative to re-architect the space enterprise for warfighting. We have already programmed in some incremental resilience upgrades to our protected SATCOM, Missile Warning and Global Positioning System satellites and are now doing the analysis to inform the future architectures.

To fully implement the warfighting construct, we must continue to develop strong partnerships within the U.S. Government (DoD/IC/Civil) and with the growing capabilities of Allies and the commercial space sector. Each partner has unique strengths they can bring to bear in support of the goal to deter and dissuade a conflict from extending into space. One key partnership we highlight throughout this testimony is the Air Force and NRO relationship regarding the Space Enterprise Vision and SWC. Another is our evolving partnership with the Missile Defense Agency as they deliver the Long Range Discrimination Radar to the Air Force, while we concurrently address emerging threats by making the Overhead Persistent Infrared enterprise more resilient through diversified architectures. On the civil side we are partnering with providers of space-based weather capabilities and have been working with the Federal Aviation Administration, a long-term partner on position, navigation and timing, on space traffic

management solutions. Regarding international partnerships, one of our recent successes is the inclusion of Japan's Self-Defense Forces into the Schriever Wargame, our annual exercise to explore critical space issues and investigate the integration activities of multiple agencies associated with space systems and services. In the last Schriever Wargame, our Five Eyes partners, together with France and Germany, were active participants and we anticipate Japan being a full participant in the exercise which is scheduled to occur in the fall of 2018. We remain committed to expanding and leveraging all partnerships going forward.

#### **JOINT WARFIGHTING NEAR TERM IMPERATIVES**

##### **1) Developing Effective and Responsive Space Command and Control**

###### *a) National Space Defense Center*

The National Space Defense Center (NSDC), formerly known as the JICSpOC, was renamed by U.S. Strategic Command (USSTRATCOM) to better reflect its purpose, which is to defend and secure the space domain. Responsibility for the NSDC officially transferred from AFSPC and the Space Security and Defense Program (SSDP) to Joint Functional Component Command for Space (JFCC Space) under USSTRATCOM in fiscal year (FY) 2016. This organization entered its initial phase of operations in November 2016 following a series of experiments and exercises designed to explore, develop, and refine operational concepts and tactics, techniques and procedures. The Air Force has shouldered the preponderance of the resource responsibility in establishing the NSDC by freeing up facility space at Schriever Air Force Base, using Air Force dollars and manpower to outfit those spaces and providing the leadership that allowed for the execution of the experimentation phase. Furthering our commitment, we are now expanding the existing NSDC floor space, upgrading the underlying infrastructure, outfitting the information systems and providing a large portion of the manpower

to establish an around-the-clock operational capability that will play a key role in deterring any adversary that might consider extending a conflict to space, and to ensure critical space capabilities for our forces should deterrence fail.

*b) Command and Control*

Our Joint Warfighters must have the capability to command and control our joint space forces, discover and fuse multiple data sources at all classification levels, and to share this decision quality information to diverse operations floors on tactically relevant timelines across the space organization enterprise. Delivering this critical capability is my highest priority and we have several parallel efforts working to meet this priority.

Joint Space Operations Center (JSPOC) Mission System (JMS) Increment 2 is still in development and is planned to be delivered by May of 2019. This system will provide space situational awareness data required for C2 of our space systems. Specifically, JMS will provide near real time, high accuracy position of all objects tracked by space situational awareness (SSA) sensors. JMS will also provide decision-quality information on the detection and situational awareness of space events such as launches, maneuvers, close proximity operations, breakups, separations, reentries, conjunctions and de-orbits. The JSPOC, NSDC and the National Reconnaissance Operations Center will have access to JMS applications and data to ensure seamless space situational awareness across the operations centers.

However, space C2 is larger than SSA and we must accelerate our efforts to put C2 tools in the hands of our warfighters. We are accelerating the space C2 capability development by partnering with the Air Force Research Laboratory (AFRL) to meet a space C2 Joint Emergent Operational Need (JEON) and with the Air Force Rapid Capability Office (AFRCO) for continued development of space C2. These partnerships will allow us to make use of their

proven rapid prototyping to assess new concepts and technologies, leverage the broad commercial industry, reduce risk to acquisition, and field early capability. We will leverage the demonstrated success of AFRL's C2 prototypes and the AFRCO's rapid capability development and fielding experience from the Common Mission Control Center (CMCC). This plan capitalizes on Air Force investments in industry consortia developed open architecture standards to provide a framework and process for agile acquisition that enables the Air Force to increase the pace of producing capability.

The plan is for AFRL to complete the initial space C2 capability in response to the JEON by the end of FY 2018, and in parallel, AFRCO has started work on the framework and a scalable capabilities prototype with the intent of integrating the JEON effort into the AFRCO's prototype.

The results of the AFRCO's work will be proliferated through the space enterprise with the program called Enterprise Space Battle Management C2 (ESBMC2) and transitioned to a Space and Missile Systems Center (SMC) Program of Record in the 2021 timeframe. Ultimately, the enterprise will leverage industry and commercial capabilities to the maximum extent possible to rapidly develop applications. The AFRCO is renowned for their ability to move fast, which supports the Air Force's commitment to increase the pace with which we field space systems.

## 2) Improved Space Situational Awareness

Our other top priority is to enhance awareness of the space domain. We are leading an effort to fundamentally change our approach to SSA operations from cataloging to warfighting. In a warfighting domain, domain awareness is essential to successful mission accomplishment. Today's SSA capability is catalogued focused and based on passive tracking. As potential

adversaries continue to field capabilities that challenge our freedom of access in space, we need better SSA tools, methodologies and CONOPS to enhance the Nation's SSA mission. AFSPC, in partnership with the NRO, has taken action codified in a CONOPS to guide our way forward in this endeavor. We have already activated the 18th Space Control Squadron (18 SPCS) under the 21st Space Wing in order to increase our overall operational effectiveness and agility. The 18 SPCS, as the focal point for SSA, will drive great tactical synergy alongside our other SSA units.

AFSPC and NRO have developed an SSA architecture designed to meet the DoD and Intelligence Community needs to enable space protection. As a result of the architecture work, we have developed a collaborative acquisition program to meet both NRO and Air Force Indications and Warning and SSA requirements. This new program is called SILENT BARKER.

Another element of SSA includes space traffic management (STM), a concept that includes technical as well as regulatory elements to provide a framework for the safety, security and stability of space activities in the future. I have met with the Federal Aviation Administration Administrator and we have agreed to develop a pilot program to serve as a pathfinder to inform the STM construct moving forward.

#### **RESILIENT ARCHITECTURE**

As I mentioned previously, we have a near term imperative to transition our current on orbit space architecture into a resilient defensible architecture.

##### **1) Protected SATCOM**

Global satellite communications (SATCOM) is essential to every warfighter. To that end, protected SATCOM resiliency efforts are currently underway for the Advanced Extremely

High Frequency (AEHF) constellation. We have identified several on-orbit resilience initiatives that provide significant operational benefits. Efforts include new space vehicle (SV) hardware and software modifications for AEHF-6. Additional modifications are also underway for SV and ground software modifications that will be used by all AEHF satellites (SVs 1-6) to provide significant resiliency capability to mitigate current and emerging threats.

In the future protected SATCOM architecture, strategic SATCOM will continue to utilize the extended data rate (XDR) waveform to enable nuclear command and control services in all operational environments. Protected tactical communications will employ the Protected Tactical Waveform (PTW) to support tactical services in benign and contested environments. Future protected SATCOM systems will be designed to provide both mid-latitude and polar coverage (65°S to 90°N). To bridge the gap between the Enhanced Polar System and full deployment of these future capabilities, a separate mid-term polar solution will be fielded to provide coverage using the XDR waveform. These current and future efforts will support resiliency options for AEHF and follow-on systems to meet warfighter SATCOM requirements.

## 2) Missile Warning

In support of strategic and tactical missile warning, we completed production and delivery of the fourth Space Based Infrared System Geosynchronous Earth Orbit (SBIRS GEO) space vehicle. On January 20, 2017, GEO-4 (Flight-3) launched from Space Launch Complex-41 on Cape Canaveral Air Force Station. SBIRS GEO-4 Flight-3 will supplement the existing constellation of infrared missile warning satellites, and fulfills our commitment to U.S. Strategic Command, Missile Defense Agency, the Intelligence Community and warfighters deployed in harm's way. SBIRS GEO-3 Flight 4 is projected for launch later this fall completing the constellation architecture originally envisioned for the program.

Several Missile Warning resiliency efforts are currently underway for SBIRS GEO SV 5 and beyond. In our work during the SEV Missile Warning Tiger Team study, we identified significant operational benefits and funded operational resiliency initiatives to increase our survivability rates in the face of a direct attack. Additionally, the Air Force is pursuing a partnership with the Missile Defense Agency to develop a combined theater missile warning / defense system to address emerging threats and adversaries' evolving tactics. This combined system could increase our mission performance as well as increase our resiliency through diversified orbital layers with a proliferated constellation.

Additionally, AFSPC operationally accepted the SBIRS Block 10 ground system. Block 10 consolidated operations centers for the Defense Support Program (DSP), SBIRS Highly Elliptical Orbit (HEO) and SBIRS GEO constellations from three separate operating locations into one primary location, providing significant capability performance increases and effectiveness in integrated missile warning and battlespace awareness. AFSPC also declared IOC in September 2016 on the OPIR Battlespace Awareness Center located at Buckley Air Force Base, Colorado. This new capability delivered optimized ground processing to exploit the full potential from our SBIRS satellites to increase detection and reporting on critical Battlespace Awareness event within minutes.

### 3) Assured Access to Space

Assured access to space is critical to the national security of the United States. The Air Force has launched 70 national security mission over the past 17 years without a single mission failure. All space operations hinge on assured access to the space domain and successful launches are the result of close collaboration between AFSPC and a host of partners to maintain on-demand access to the high ground.

Since February 2016 there have been ten successful national security EELV missions: Global Positioning System (GPS) IIF-12; National Reconnaissance Office Launch (NROL)-45; NROL-37; Mobile User Objective System (MUOS)-5; NROL-61; AFSPC-6; Wideband Global SATCOM (WGS)-8; SBIRS GEO-4 (Flight 3); NROL-79; and WGS-9.

The Air Force goal remains maintaining two or more domestic commercial launch service providers that are capable of lifting the entire national security space manifest in support of our enduring commitment of assured access to space. Toward that end we certified SpaceX's Falcon 9 Upgrade and initiated the new entrant certification process for their heavy launch vehicle. We are excited about adding another launch vehicle to our complement of available launch providers and look forward to more opportunities in this area going forward. We have also initiated the new entrant certification process for United Launch Alliance's Vulcan launch vehicle and Orbital ATK's Next Generation Launch Vehicle.

We awarded the first competitive EELV mission in over a decade last year to SpaceX and a second GPS mission was awarded in March 2017. These missions will launch in 2018 and 2019, and show how the revitalization of competition is good for our national defense by providing assured access to space while improving affordability. This coming year, twelve national security space launches across a variety of mission sets will be competed. Going forward, the Air Force is laser-focused on maintaining mission success and implementing a strategy that supports sustainable competition that we expect will improve affordability.

The Air Force is also committed to transitioning off the Russian RD-180 engine while maintaining assured access to space, and will achieve this by partnering with industry through shared investment to also meet the more stressing national security launch needs. Additionally, the Air Force is investing in rocket propulsion system prototypes in compliance with the Fiscal

Years 2015, 2016, and 2017 National Defense Authorization Acts. The Air Force will bridge these Other Transaction Authority agreements into launch services.

An important element of assured access to space is the health and reliability of our range infrastructure. One of the exciting initiatives we have been working towards is the integration of the Autonomous Flight Safety System (AFSS) into our launch vehicles. This system greatly reduces dependencies on range infrastructure, human capital and the associated control centers during flight. SpaceX had their first launch using AFSS on February 18, 2017 and we are pushing to have all launch providers and weapons testers adopt AFSS as the standard.

#### 4) Global Positioning System

The Global Positioning System (GPS) constellation remains healthy, stable, and robust with 31 operational satellites on-orbit providing precise position, navigation, and timing information to civil and military users worldwide.

In May 2008, the GPS III contract was awarded to Lockheed Martin for the development and production of two initial SVs, with eight more production vehicles now on contract and options for the production of up to two additional SVs. GPS III SV 01 has been completed and is in storage, with an initial launch capability date set to occur in spring 2018. It will be the first GPS satellite on-orbit with Military Code (M-Code) signals in support of warfighter operations. GPS III will introduce new capabilities to meet higher demands of both military and civilian users. Additionally, it expands international cooperation in the Global Navigation Satellite System (GNSS) arena by fielding the new L1C civil signal interoperable with European Galileo System, Japanese Quasi-Zenith Satellite System, and other GNSS systems. For SV 11 and beyond, the GPS III Follow-On studies are now underway and the plan is to release a request for proposal later this summer.

The GPS Next-Generation Operational Control System (OCX) is the ground component of the next generation GPS system. Air Force remains committed to turning the OCX program around from the challenges it has faced. We have implemented a number of corrective actions in partnership with Raytheon to stabilize program performance and we will continue regular deep dive reviews with the Under Secretary of Defense for Acquisition Technology and Logistics.

A Defense Acquisition Board for an OCX Milestone B decision will be held no later than June 30, 2017. In the meantime, progress continues to deliver Block 0, which will provide initial launch and checkout capability for GPS III satellites, implementing industry best practice development operations on Block 1 and finishing the Iteration 1.6 software.

##### 5) Weather Satellite Follow-on

The Defense Meteorological Satellite Program (DMSP) continues to be the workhorse of DoD's Space Based Environmental fleet, providing critical cloud characterization and theater weather imagery data to the DoD and the world meteorological community.

In March, the Commander of USSTRATCOM and Secretary of the Air Force initiated a program through our Operationally Responsive Space Office to address immediate warfighter requirements for the top two priority gaps, while mitigating operational risk in the event of the premature loss of DMSP satellites. To help mitigate this need in the near-term, the DoD is assessing the transfer of a NASA GOES weather satellite to the Air Force and requisite infrastructure to help with weather monitoring coverage. Additionally, AFSPC has conducted significant analysis of potential materiel solutions, as part of recently-awarded weather Broad Agency Announcement efforts and is poised to proceed with materiel development. To that end, the Air Force has been engaged with the Joint Staff and is awaiting direction on the development of a materiel solution that will meet requirements in this important mission area.

#### **NATIONAL SECURITY SPACE MANAGEMENT INITIATIVES**

We greatly appreciate your focus on National Security Space Organization and Management. The Air Force has led America's national security operations in space for more than 60 years. Due to the Air Force's global perspective and under its leadership, we have seen space, the foundation of our strategic decision making in the Cold War, evolve to become central to every aspect of Joint Warfare. As previously stated, we recognize potential adversaries are working to undermine our space capability advantages. To maintain space superiority in an increasingly contested and congested environment, we must strengthen the leadership, management, acquisition, and organization of DoD space capabilities as a joint warfighting domain normalized with the way we fight in other domains. To address this problem statement the Department is working four lines of effort, 1) Strategy and Policy, 2) Strengthen CONOPs and Requirements Development, 3) Speed Acquisition to Stay Ahead of Adversaries and 4) Strengthen Joint Warfighting Organizations.

We are aggressively moving forward in the near term in each of these lines of effort to meet our growing challenges.

The Air Force Chief of Staff is the Joint Chief responsible for presenting space capabilities for the Joint Force and to maintain firm control of operational requirements. The Air Force is establishing a 3-star Deputy Chief of Staff for Space Operations (A11) to actively posture our service's senior leaders with the right expertise to treat space as a warfighting domain. The A11 streamlines operations and requirements decision making through the CSAF to the Joint Staff to meet the demands of a warfighting domain.

In addition, as a Service component to USSTRATCOM, AFSPC provides the Combatant Commander with the preponderance of its space power. We continue to hone our Joint

Warfighting focus, are committed to performing our mission in lock step with our national security space partners, and we stand ready to respond and provide new and upgraded capabilities when and where the Nation needs. We are fully supportive of the USSTRATCOM Commander's recent realignment activities which simplify and strengthen USSTRATCOM's command structure.

In this realignment, I will serve as USSTRATCOM's Joint Forces Space Component Commander, thus elevating the operational commander responsible for day-to-day space operations to a four-star position. This aligns the service component and joint forces component under one commander and elevates the component to a 4-star commander. This best postures us to better integrate space capabilities into joint theater operations leading to normalized command relationships with theater commanders. Finally, this new role also effectively empowers the AFSPC Commander to better inform joint requirements. This should drive toward more integrated requirements consistent with Joint Requirements Oversight Council intent.

The Air Force is also taking steps to streamline the acquisition process, enhance responsiveness to threats in space, strengthen requirements and bolster the Space Warfighting Construct.

Consistent with the 2016 National Defense Authorization Act, the Air Force has requested Milestone Decision Authority for space programs be returned to the Air Force. This will reduce review layers and allow the Service to be more responsive and to move more rapidly.

We are strengthening the Joint Requirements Process for space to provide a space focus on the Joint Staff. The previously mentioned A11 will provide significant assistance towards this effort. Additionally, we are increasing our analytical and prototyping efforts to support architecture development. This has already paid significant dividends as we have changed our

SILENT BARKER acquisition strategy to partner with the NRO to provide us greater capability, faster and at the same cost. Finally, we are leveraging the rapid acquisition authorities of AFRCO and the Operationally Responsive Space office more broadly.

#### **CONCLUSION**

The Space Domain is a Joint Warfighting Domain just like the air, land, and sea and the Airmen of Air Force Space Command are Joint Warfighters. Today, our space enterprise remains the envy of the world but potential adversaries are making gains and there is hard joint warfighting work to be done to stay ahead of our growing challenges. It is a national imperative that we posture ourselves to deter any conflict that would extend to space, and if deterrence were to fail that we fight and win. Our national security and the security of our Allies depends on it. I thank the Committee for their leadership and support and look forward to our continued partnership to provide resilient, capable, and affordable space capabilities for the Joint Force and the Nation.

### **General John W. “Jay” Raymond**

Gen. John W. “Jay” Raymond is Commander, Air Force Space Command, Peterson Air Force Base, Colorado. He is responsible for organizing, equipping, training and maintaining mission-ready space and cyberspace forces and capabilities for North American Aerospace Defense Command, U.S. Strategic Command and other combatant commands around the world. Gen. Raymond oversees Air Force network operations, manages a global network of satellite command and control, communications, missile warning and space launch facilities, and is responsible for space system development and acquisition. The command comprises approximately 38,000 space and cyberspace professionals assigned to 134 locations worldwide. Gen. Raymond also directs and coordinates the activities of the headquarters staff.

Gen. Raymond was commissioned through the ROTC program at Clemson University in 1984. He has commanded the 5th Space Surveillance Squadron at Royal Air Force Feltwell, England, the 30th Operations Group at Vandenberg Air Force Base, California, and the 21st Space Wing at Peterson AFB, Colorado, 14th Air Force, United States Strategic Command, Joint Functional Component Command for Space. He deployed to Southwest Asia as Director of Space Forces in support of Operations Enduring Freedom and Iraqi Freedom. The general's staff assignments include Headquarters Air Force Space Command, U.S. Strategic Command, the Air Staff and the Office of Secretary of Defense.

Prior to assuming command of Air Force Space Command, Gen. Raymond was the Deputy Chief of Staff for Operations, Headquarters U.S. Air Force, Washington, D.C.

#### **EDUCATION**

1984 Bachelor of Science degree in Administrative Management, Clemson University, S.C.  
 1990 Squadron Officer School, Maxwell AFB, Ala.  
 1990 Master of Science degree in Administrative Management, Central Michigan University, Mt. Pleasant  
 1997 Air Command and Staff College, Maxwell AFB, Ala.  
 2003 Master of Arts degree in National Security and Strategic Studies, Naval War College, Newport, R.I.  
 2007 Joint Forces Staff College, Norfolk, Va.  
 2011 Combined Force Air Component Commander Course, Maxwell AFB, Ala.  
 2012 Joint Flag Officer Warfighting Course, Maxwell AFB, Ala.

#### **ASSIGNMENTS**

1. August 1985 - October 1989, Minuteman intercontinental ballistic missile crew commander; alternate command post; flight commander and instructor crew commander; and missile procedures trainer operator, 321st Strategic Missile Wing, Grand Forks AFB, N.D.
2. October 1989 - August 1993, operations center officer controller, 1st Strategic Aerospace Division, and executive officer, 30th Space Wing, Vandenberg AFB, Calif.
3. August 1993 - February 1996, Chief, Commercial Space Lift Operations, assistant Chief, Current Operations Branch, Headquarters Air Force Space Command, Peterson AFB, Colo.
4. February 1996 - August 1996, Deputy Director, Commander in Chief's Action Group, Headquarters Air Force Space Command, Peterson AFB, Colo.
5. August 1996 - June 1997, student, Air Command and Staff College, Air University, Maxwell AFB, Ala.
6. June 1997 - August 1998, space and missile force programmer, Headquarters U.S. Air Force, Washington, D.C.
7. September 1998 - April 2000, Chief, Expeditionary Aerospace Force Space and Program Integration, Expeditionary Aerospace Force Implementation Division, Headquarters U.S. Air Force, Washington, D.C.

8. April 2000 - June 2001, Commander, 5th Space Surveillance Squadron, Royal Air Force Feltwell, England
9. June 2001 - July 2002, Deputy Commander, 21st Operations Group, Peterson AFB, Colo.
10. July 2002 - June 2003, student, Naval War College, Newport, R.I.
11. June 2003 - June 2005, transformation strategist, Office of Force Transformation, Office of the Secretary of Defense, Washington, D.C.
12. June 2005 - June 2007, Commander, 30th Operations Group, Vandenberg AFB, Calif.  
(September 2006- January 2007, Director of Space Forces, Combined Air Operations Center, Southwest Asia)
13. June 2007 - August 2009, Commander, 21st Space Wing, Peterson AFB, Colo.
14. August 2009 - December 2010, Director of Plans, Programs and Analyses, Headquarters Air Force Space Command, Peterson AFB, Colo.
15. December 2010 - July 2012, Vice Commander, 5th Air Force, and Deputy Commander, 13th Air Force, Yokota Air Base, Japan
16. July 2012 - January 2014, Director of Plans and Policy (J5), U.S. Strategic Command, Offutt AFB, Neb.
17. January 2014 - August 2015, Commander, 14th Air Force (Air Forces Strategic), Air Force Space Command, and Commander, Joint Functional Component Command for Space, U.S. Strategic Command, Vandenberg AFB, Calif.
18. August 2015 - October 2016, Deputy Chief of Staff, Operations, Headquarters, U.S. Air Force, Washington, D.C.
19. October 2016 - present, Commander, Air Force Space Command, Peterson AFB, Colo.

#### **SUMMARY OF JOINT ASSIGNMENTS**

1. June 2003 - June 2005, transformation strategist, Office of Force Transformation, Office of Secretary of Defense, Washington, D.C., as a colonel
2. July 2012 - January 2014, Director of Plans and Policy (J5), U.S. Strategic Command, Offutt AFB, Neb., as a major general
3. January 2014 - August 2015, Commander, Joint Functional Component Command for Space, USSTRATCOM, Vandenberg AFB, Calif., as a lieutenant general

#### **OPERATIONAL INFORMATION**

Badges: Master Space Operations Badge, Master Missile Operations Badge

Systems: Counter Communications System, Deep Space Tracking System, Minuteman III

#### **MAJOR AWARDS AND DECORATIONS**

Distinguished Service Medal with oak leaf cluster

Defense Superior Service Medal

Legion of Merit with oak leaf cluster

Meritorious Service Medal with four oak leaf clusters

Air Force Commendation Medal

Combat Readiness Medal

Global War on Terror Expeditionary Medal

Global War on Terrorism Service Medal

#### **OTHER ACHIEVEMENTS**

2007 General Jerome F. O'Malley Distinguished Space Leadership Award, Air Force Association

2015 Thomas D. White Space Award, Air Force Association

2016 Peter B. Teets Government Award, National Defense Industrial Association

#### **EFFECTIVE DATES OF PROMOTION**

Second Lieutenant July 20, 1984

First Lieutenant July 20, 1986

Captain July 20, 1988

Major July 1, 1996

Lieutenant Colonel July 1, 1999

Colonel July 1, 2004  
Brigadier General Aug. 19, 2009  
Major General May 4, 2012  
Lieutenant General Jan. 31, 2014  
General, Oct. 25, 2016

(Current as of October 2016)

HOUSE COMMITTEE ON ARMED SERVICES  
SUBCOMMITTEE ON STRATEGIC FORCES

STATEMENT OF

LIEUTENANT GENERAL DAVID J. BUCK

COMMANDER

JOINT FUNCTIONAL COMPONENT COMMAND FOR SPACE

BEFORE THE HOUSE ARMED SERVICES SUBCOMMITTEE ON STRATEGIC  
FORCES ON FISCAL YEAR 2018 PRIORITIES AND POSTURE OF THE  
NATIONAL SECURITY SPACE ENTERPRISE

19 MAY 2017

HOUSE COMMITTEE ON ARMED SERVICES  
SUBCOMMITTEE ON STRATEGIC FORCES

**Introduction**

Chairman Rogers, Ranking Member Cooper, Members of the Subcommittee, thank you for your steadfast support of our men and women in uniform and this Nation. As this Committee is well aware, we've turned an educational corner of sorts. It's now widely-acknowledged that space is critical to the American way of life . . . this, coupled with an understanding of the compelling and compounding threats to our freedom of action in space, is the burning platform to evolve the National Security Space enterprise. It doesn't require a clean-slate approach; however, an overhaul is necessary to guarantee our freedom of access in, through and from space.

This is a challenge because, in the formative years, our National Security Space architecture was conceived, built and resourced to provide services or commodities during an era when our most significant co-orbital concern was debris. Given the emerging threat, we can no longer approach space with this service-provider mentality. Moving forward as Commander, Joint Functional Component Command for Space (JFCC SPACE), a foremost responsibility is to gain and maintain space superiority. This is a prerequisite for protecting and defending the Space Joint Operating Area and providing space force effects for Joint force combat engagement around the globe.

Over the past year we've made substantial progress especially with respect to all-domain operations and our mission to protect and defend the National Security Space enterprise. We are better warfighters. There are, however, areas that require continued focus and vigilance.

**Normalizing Space Operations**

Military campaigns can be domain-centric, but war is domain-agnostic--there is no such thing as a space war . . . at the macro level, it's all war. In this respect, we must treat space as we do every other domain (similar approaches, lexicon and mentality). We've made significant progress inculcating the warrior mindset and ethos with our space operators. However, we won't realize full potential until our Joint forces are as conversant about space as they are in air, land, sea and cyberspace, and space operations are fully synchronized in planning and execution.

The Space Mission Force, or SMF, construct, now in various stages of maturity across our operational Air Force space units, is central to transforming operations. The SMF focuses on the human capital aspect; it tunes our operators for current operations and prepares them for the future fight. The inherent combat operations and dwell (with advanced training) cycle underpins the evolution from service providers to warfighters--from solving engineering problems to fighting through contested, degraded and operationally-limited environments.

The good news is that I'm not talking about culture change much anymore. The young Soldiers, Sailors, Airmen and Marines who show up for duty at our space squadrons and centers have baked-in warfighter mentalities and ethos--we instill this from day one and they know no difference. We have also made significant strides evolving how we operate in the space domain over the past year. Yet there is still work to do. We have the warfighters, now we must equip them with the right tools, processes and partnerships to solidify our freedom of action in space.

**Space Situational Awareness**

As in all domains, we need knowledge and awareness of activities in, through and from space. This space situational awareness (SSA) is foundational and remains one of my critical

focus areas. Future conflict may very well begin in space . . . or cyberspace . . . or deep undersea--domains that challenge our ability to attribute hostile action or intent. For my part, I'm compelled to continuously improve our ability to discern who, what, when, where, why, and how --joint-warfighting awareness principles that enable space superiority. To this end, we've made good progress with several initiatives.

An important milestone was the activation of the 18th Space Control Squadron (18 SPCS) under the 21st Space Wing. This reorganization transitioned tactical-level SSA functions from the Joint Space Operations Center (JSpOC) to a squadron. The experts at the 18 SPCS focus on tactical-level functions such as sensor management, tasking and catalog maintenance. This frees the JSpOC, at the operational level, to concentrate on proactively providing terrestrial space effects for the Joint fight.

In the same vein, we recognize that some Space Traffic Management (STM) tasks are not central to our military mission--things like debris mitigation, conjunction data messages, advocacy for norms of behavior, etcetera. The Department of Defense (DoD) must always perform the SSA mission, maintain the single authoritative catalog and keep primacy over sensor tasking; however, certain STM functions may be better suited for a civil agency. To this end, the Federal Aviation Administration (FAA) Administrator and I have agreed to begin a pilot program to determine the correct path forward. As part of the pilot program, I anticipate a small footprint of FAA representatives working side-by-side with our space operators this year. However, we will continue to perform STM functions until we come to an agreement with another agency or agencies to assume some of these functions.

The JSpOC's Commercial Integration Cell (CIC) is a benchmark for commercial-military partnership. The trust built through daily interactions with full-time, commercial satellite

operator presence on the JSpOC operations floor is mutually beneficial. The ability to share information at the operational level provides insight into commercial perspectives, capabilities, best practices and technical solutions. Our commercial partners collaborate in areas like theater support, SSA, resiliency, threat mitigation and exercises. We are in the process of folding an additional company (the seventh) into this important partnership. The CIC is breaking new ground yet traditional contract mechanisms are either geared toward services contracts or research and development agreements--neither is a long-term fit for the CIC. Currently, the CIC is enabled through the latter . . . a set of Cooperative Research and Development Agreements (CRADA). We have more work to do in this area and we are proposing to extend the CRADAs to further explore options to ensure an enduring partnership.

We continue to modernize and optimize our terrestrial SSA collection infrastructure. Most notably, the Space Fence under construction at Kwajalein Atoll in the Western Pacific is on schedule for delivery in early 2019. We are excited about the projected ten-fold increase in capability it will provide--allowing us to see orbital inclinations with new, un-cued detection capabilities. Furthermore, the C-band Radar was successfully relocated to Western Australia and is operational and making significant contributions to our space surveillance network from this critical region. This new strategically significant SSA capability is indicative of our strong partnership with Australia.

The space layer of SSA was enhanced with the launch of the third and fourth Geosynchronous SSA Program (GSSAP) satellites last August. We anticipate initial operational capability from space vehicles 3 and 4 this summer. The GSSAP mission is to collect and transmit SSA data from the geosynchronous regime. Through close proximity operations, the GSSAP enables characterization for surveillance, anomaly resolution and orbital tracking data.

The constellation is operated by the 1st Space Operations Squadron at Schriever Air Force Base (AFB), Colorado. These warfighters continue to refine their craft and codify tactics, techniques and procedures while operating our “freshest set of eyes” 22,500 miles above the surface of the earth. The GSSAP constellation has already proven to be a cornerstone of our ability to ensure freedom of action in space.

#### **Space Intelligence and Indications and Warnings**

Another focus area is space intelligence and indications and warning (I&W). In all domains, robust, actionable, intelligence underpins successful operations and is critical to understanding and predicting adversary intentions and actions. This is an area ripe for growth as our national space intelligence capability has atrophied. I understand this cannot happen overnight--improving our intelligence capabilities and I&W will take time. First we must find the billets and then grow the core expertise, but we've started the conversation. To this end, the Air Force A2 has planted the seed corn by initiating a task force to assess Air Force Intelligence, Surveillance and Reconnaissance support to space operations. I am grateful for this attention and advocacy. Similarly, I am pleased with the drive within the National Intelligence Community to bolster their space intelligence capabilities across a number of agencies. Again, I recognize that this will take time, but I am also grateful for their current support to my mission and look forward to continued partnership in this area.

#### **Authorities and Rules of Engagement**

We must also get the right authorities pushed to the right level at the right time with clear Rules of Engagement (ROE). We're discovering through test and experimentation that the speed of a fight in, through and from space requires further delegation of authorities to enable

flexibility on the operational-level commander's timing and tempo. Today, the planning and approval process for certain missions can take weeks--much of this time is consumed by requirements to gain approvals from the highest-level decision-makers in the DoD. In a bygone era . . . with a service-provider construct in a permissive environment . . . there was not a compelling case to modify these authorities or implement ROEs. Today--against a thinking, capable and agile adversary--existing authorities and ROEs severely limit my ability to protect, defend and provide space effects for the Joint fight. Gaining and maintaining space superiority is foundational to everything we do. Working with higher headquarters and the Office of the Secretary of Defense, we have made progress in several respects, and we need to keep at it. I've directed my team to continue examining and exercising space authorities and ROEs during every experiment conducted at the JSPOC and National Space Defense Center (NSDC). This will help inform and provide advocacy to implement the right policies for space control that is in consonance with other domains.

#### **Battle Management and Command and Control (BMC2)**

If command and control isn't good, warfighting isn't good. Even with optimal authorities and ROEs, we will fall short absent battlespace management and command and control for our space forces. We must continue to push the edge of the C2 envelope and vigorously pursue capabilities that improve domain awareness and command and control on tactically- and operationally-relevant timelines.

Air Force Space Command (AFSPC), Air Force Rapid Capabilities Office (AFRCO), Space and Missile Systems Center (SMC), Air Force Research Lab (AFRL) and JFCC SPACE are partnering to rapidly develop BMC2 capabilities to address emerging threats. The AFRL BMC2 Joint Emergent Operational Need (JEON) team will execute three spirals of system

development over a two-year period focused on delivering initial infrastructure and applications. The JEON will provide solutions for the top 25 capability statements derived from test and experimentation efforts. The third spiral will be complete in Fiscal Year 2019.

Concurrently, the AFRCO will leverage rapid prototyping and an industry consortium to develop the BMC2 operational prototype. The industry consortia will help define open architecture standards consistent with models used with the Common Mission Control Center effort. The AFRCO will take advantage of inherent expertise with C2 development. The AFRCO will absorb the AFRL's JEON efforts with Spiral 4 to ensure the baseline infrastructure and software are consistent with the open architecture standards for space. Importantly, our space operators will be integrated with the systems development and demonstrations to ensure the program meets operators' needs. The operational prototype is scheduled to complete in the 2021 timeframe.

The Space and Missile Systems Center will lead the Enterprise Space Battle Management Command and Control (ESBMC2) program of record and serve as the enterprise manager to coordinate integration and interoperability activities across the operations centers. The SMC will sustain and modernize ESBMC2 as the program of record following the transition of the operational prototype from AFRCO. The JSpOC and the NSDC are the centerpieces of this ESBMC2 program of record.

Progress continues with the NSDC at Schriever AFB, Colorado. Changing the name of the Joint Interagency Combined Space Operations Center, or "JICSpOC," to "National Space Defense Center" is more than a name change. It captures the success, maturation and essence of this center. This said, words matter . . . and a key enabler thus far at the NSDC is the integration

of the DoD, National Reconnaissance Office (NRO) and key organizations and agencies within the National Intelligence Communities.

We discovered through experimentation that it makes more sense to keep the entry point for foreign partners--the "C" or "Combined" aspect--at the JSpOC. This is where the integration with our allies takes place. It is more efficient to leverage these relationships at Vandenberg AFB with existing facilities and processes. Additionally, "JICSpOC" did not convey the mission of the organization as my primary node for national space defense--for protecting and defending the Space Joint Operating Area. The space pros at the NSDC are on the front lines of ensuring our freedom of action in space. The "National Space Defense Center" naming convention effectively communicates this mission. Over the coming year, I'm focused on ensuring we receive adequate manning while keeping the foot on the gas pedal to ensure the BMC2 system delivery remains on track. Currently, there are over 80 people present for duty at the NSDC. I anticipate over 200 personnel working in the NSDC next year.

A key benefit of the NSDC is allowing the JSpOC at Vandenberg AFB to focus on space integration with the terrestrial Joint fight. The JSpOC will remain the integration center for our allied and commercial partners. So while our foreign teammates will not physically reside at the NSDC, they continue to be valuable partners at both the JSpOC and JFCC SPACE headquarters. This is important because if we're going to fight together, we must plan together.

This summer, we expect officers from each of our resident foreign partners--Australia, Canada, and Great Britain--to be certified Chiefs of Current Operations (CCO) at the JSpOC. For context, the CCO leads the team responsible for command and control of the DoD space enterprise and is my operational eyes and ears--vital to daily operations and integral to supporting Coalition forces worldwide. Beyond their support of daily operations, these officers

will also aid in expanding the integration between the JSpOC and their respective countries' space operations centers.

Under United States Strategic Command direction, we are also standing up a Multinational Space Collaboration (MSC) effort to facilitate information sharing with like-minded nations beyond our FVEY partners. The MSC effort allows us to explore mutual capabilities and identify opportunities for greater integration with additional international partners by collocating international liaison officers with U.S. space operators at Vandenberg AFB. We are in the final stages of concluding an agreement with Germany for a liaison officer to JFCC SPACE as the first addition under this construct. I anticipate the liaison officer will be posted at Vandenberg AFB this summer and, based on interests from other foreign partners, we expect more to follow. These partnerships help secure home-field advantage across the globe.

Progress continues toward consolidating our staff and operations center at Vandenberg AFB into a single and modern facility. The JSpOC currently resides in a refurbished Titan booster hangar and, while it has served us well for nearly a decade, this repurposed hangar cannot meet future power and communications requirements. The refurbishment of an existing facility at Vandenberg AFB is moving forward following successful relocation of critical Western Range equipment to facilitate building modifications. We project full operational capability and occupancy late 2019.

### **Conclusion**

Every challenge is an opportunity . . . and we have many opportunities in space. As a learning organization, we will naturally continue to mature our approaches and organizational structures. The speed and complexity of future fights demands operationally agile organizations.

We look forward to working closely with General Raymond and Air Force Space Command to implement General Hyten's organizational vision for United States Strategic Command. I am wholly confident we are postured to meet future challenges and to preserve freedom of action in space for this great Nation. I thank the Committee for their leadership and advocacy and look forward to our continued partnership to guarantee our freedom of action in space for the Joint Force and the Nation.

### **Lieutenant General David J. Buck**

Lt. Gen. David J. Buck is Commander, 14th Air Force (Air Forces Strategic), Air Force Space Command; and Commander, Joint Functional Component Command for Space, U.S. Strategic Command, Vandenberg Air Force Base, California.

As the U.S. Air Force's operational space component to USSTRATCOM, General Buck leads more than 19,500 personnel responsible for providing missile warning, space superiority, space situational awareness, satellite operations, space launch and range operations. As Commander, JFCC SPACE, he directs all assigned and attached USSTRATCOM space forces providing tailored, responsive, local and global space effects in support of national, USSTRATCOM and combatant commander objectives.

General Buck received his commission in 1986 as a distinguished graduate of Officer Training School. His career spans a wide variety of command, operations, test and evaluation, and staff assignments. He has commanded at the squadron, group and wing levels. His operational experience includes missile operations, space launch and range operations, satellite command and control, space force enhancement, and space control. General Buck served on The Joint Staff as principal military advisor to The Chairman of The Joint Chiefs of Staff for Coalition Management. In 2010, he deployed to Southwest Asia as the Director of Space Forces for U.S. Air Forces Central. Prior to assuming his current position, General Buck was the Vice Commander, Air Force Space Command.

### **EDUCATION**

1986 Bachelor of Science degree in Business Administration, Summa Cum Laude, Kansas Newman University, Wichita, Kan.

1988 Master of Business degree in Administration, University of South Dakota, Vermillion, S.D.

1991 Distinguished Graduate, Squadron Officer School, Maxwell AFB, Ala.

1997 Master of Science degree in National Security and Strategic Studies, Naval War College, Newport, R.I.

2003 Distinguished Graduate, Master of Science degree in National Resource Strategy, Industrial College of the Armed Forces, Fort Lesley J. McNair Washington, D.C.

2007 Air Force Senior Leadership Course, Center for Creative Leadership, Greensboro, N.C.

2008 National Security Management, The George Washington University, Washington, D.C.

2009 Enterprise Leadership Seminar, University of Virginia, Charlottesville

2009 Program of Senior Executive Fellows, Kennedy School of Government, Harvard University, Cambridge, Mass.

### **ASSIGNMENTS**

1. October 1986- September 1991, Missile Combat Crew Commander, Standardization Evaluation Combat Crew Commander and Emergency War Order Instructor, 44th Strategic Missile Wing, Ellsworth AFB, S.D.

2. September 1991-August 1993, Top Hand Professional Development Program, 576th Test Squadron, Vandenberg AFB, Calif.

3. August 1993- July 1996, Aide-de-Camp, 20th Air Force, F.E. Warren AFB, Wyo.

4. July 1996- June 1997, student, College of Naval Command and Staff, Newport, R.I.

5. June 1997- June 1999, Chief, Current Force Application, Headquarters Air Force Space Command, Peterson AFB, Colo.

6. June 1999- June 2000, Speechwriter, Commander's Action Group, Headquarters Air Force Space Command, Peterson AFB, Colo.

7. June 2000- July 2002, Commander, 1st Space Launch Squadron, Cape Canaveral AFS, Fla.

8. July 2002- June 2003, student, Industrial College of the Armed Forces, Fort Lesley J. McNair, Washington, D.C.

9. June 2003- June 2005, Chief, Multilateral Affairs Division, (J5), Joint Staff, the Pentagon,

Washington, D.C.

10. June 2005- June 2006, Commander, 821st Air Base Group, Thule AB, Greenland.

11. June 2006- August 2007, Deputy Director of Strategic Plans and Programs, Headquarters Air Force Space Command, Peterson AFB, Colo.

12. August 2007- June 2008, Vice Commander, 50th Space Wing, Schriever AFB, Colo.

13. June 2008- April 2010, Commander, 30th Space Wing, Vandenberg AFB, Calif.

14. May 2010- May 2011, Director of Space Forces, U.S. Air Forces Central, Southwest Asia

15. June 2011 -May 2013, Vice Commander, U.S. Air Force Warfare Center, Nellis AFB, Nev.

16. May 2013- August 2014, Director of Air, Space and Cyberspace Operations, Headquarters Air Force Space Command, Peterson AFB, Colo.

17. August 2014- August 2015, Vice Commander, Air Force Space Command, Peterson AFB, Colo.

18. August 2015- present, Commander, 14th Air Force (Air Forces Strategic), Air Force Space Command, and Commander, Joint Functional Component Command for Space, USSTRATCOM, Vandenberg AFB, Calif.

#### **SUMMARY OF JOINT ASSIGNMENTS**

June 2003- June 2005, Chief, Multilateral Affairs Division, Directorate for Strategic Plans and Policy (J5), Joint Staff, the Pentagon Washington, D.C., as a colonel

#### **BADGES**

Master Space Operations Badge

Master Missile Operations Badge

Basic Cyberspace Operator Badge

#### **MAJOR AWARDS AND DECORATIONS**

Defense Superior Service Medal with oak leaf cluster

Legion of Merit Medal with two oak leaf clusters

Bronze Star Medal

Defense Meritorious Service Medal

Meritorious Service Medal with four oak leaf clusters

Joint Service Commendation Medal

Air Force Commendation Medal with oak leaf cluster

Air Force Achievement Medal with oak leaf cluster

#### **OTHER ACHIEVEMENTS**

2010 Air Force Association's California Military Member of the Year

2013 Gen. Jerome F. O'Malley Distinguished Space Leadership Award

#### **EFFECTIVE DATES OF PROMOTION**

Second Lieutenant June 10, 1986

First Lieutenant June 10, 1988

Captain June 10, 1990

Major Aug. 1, 1996

Lieutenant Colonel May 1, 2000

Colonel July 1, 2005

Brigadier General May 6, 2011

Major General Aug. 8, 2014

Lieutenant General Aug. 14, 2015

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Subcommittee on Strategic Forces

Committee on Armed Services

U.S. House of Representatives

May 19, 2017

Ms. Betty Sapp

Director National Reconnaissance Office

Statement for the Record

**Introduction**

Chairman Rogers, Ranking Member Cooper, and distinguished Members of the Subcommittee, I would like to thank you for the opportunity to be here on behalf of the National Reconnaissance Office (NRO), and our national security space activities. It is an honor to appear alongside my mission partners from the DoD and the Intelligence Community (IC), all of whom are critical to maintaining our nation's intelligence and warfighting superiority.

Due to the unclassified nature of this portion of the hearing, I cannot discuss the specifics of NRO programs, but I am proud of the numerous mission successes and achievements the NRO has had over the past year. I welcome the opportunity to provide more on NRO capabilities and successes during the classified session.

**NRO's Critical Mission**

The NRO is responsible for developing, acquiring, launching and operating the nation's overhead Intelligence, Surveillance, and Reconnaissance (ISR) architecture. The unique nature of overhead ISR collection allows timely access to locations around the world without risk of violating international law or putting U.S. personnel in danger. It also allows the flexibility necessary to be where we need to be, when we need to be there, and for as long as we're required. And, we continue to deliver innovative solutions and enable intelligence integration, assessment, and problem solving across geographic boundaries and intelligence domains.

The NRO supports a diverse mission set. We support the Geospatial-Intelligence (GEOINT), Signals Intelligence (SIGINT), and Human Intelligence (HUMINT) missions, and we are the foundation of the United States' (U.S.) global situational awareness. We contribute to global intelligence, military, and homeland security operations, while simultaneously assisting with the formation of national policy and achieving diplomatic goals. We provide direct support to U.S. warfighters, help protect U.S. borders, and contribute significantly to the fight against ISIS and other counter-terrorism operations. NRO capabilities contribute to the U.S.'s ability to improve battlespace awareness, deter aggression and proliferation of weapons of mass destruction, combat terrorism, identify and track High-Value Targets, and conduct security operations worldwide.

**Workforce and Innovation**

The foundation of NRO mission capabilities and contributions are our people—military, civilian, contractor support—and our partners in industry and academia. All are critical, and

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everyone counts. Our people are behind every mission success, and enable the direct support we provide to the Combatant Commands, their Service and Functional Components, and deployed tactical units. We don't just offer our military units and warfighters direct support, but also the education, training, exercise support, and subject matter expertise required to make full use of NRO systems, capabilities, data, and collection techniques.

The NRO workforce is not just talented but empowered to innovate. We instill a culture of innovation and risk tolerance in everything we do at the NRO. NRO innovation comes in many forms to include using existing satellites and sensor capabilities differently; developing new "apps" for our space and ground systems; and developing the new capabilities critical to closing intelligence collection gaps. We're also working with our mission partners to ensure we fully leverage commercial products, services, and capabilities, allowing us to focus our resources on that which only we can do.

#### **NRO's Performance Excellence**

The NRO is a small, flat, end-to-end organization fully capable of successfully delivering an increasingly capable, integrated, resilient, and affordable architecture. We have control of every function required, from the R&D that enables us to stay ahead of targets and threats, to the acquisitions required to deliver new capabilities to space and ground, to the operations required to use, adapt, and upgrade those capabilities to respond to changing mission imperatives in the field.

The NRO manages the majority of the IC's Major Systems Acquisitions (MSAs). Currently, all 15 of our MSAs are "green," meaning they are meeting or exceeding cost,

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schedule, and performance metrics. This year, the NRO received its 8th consecutive clean financial management audit, demonstrating our ability to properly manage all resources entrusted to us.

#### **NRO Strategic Thrusts**

Today's space enterprise was designed under the assumption that space was safe from intentional adversary interference and the ground infrastructure was designed with little emphasis on reliability or resiliency. We are transforming our ground and space architectures with the capability to collect against the most challenging targets—even in the presence of adversary actions. The NRO's Strategic Thrusts reflect that imperative. Our organizational priorities are to 1) develop our workforce, which I previously highlighted, 2) advance overhead collection capabilities, 3) transform ground and transport architectures, and 4) deliver end-to-end resiliency.

The NRO is advancing the sensor sensitivity of overhead SIGINT and GEOINT capabilities to collect against lower power signals and fleeting targets. We are improving the area persistence of our space-based systems to provide greater "time on target" to observe and characterize activities and the potential relationship between activities. We are working to reduce "sensor to shooter" timelines to get the right information to those who need it, when they need it. We're also developing smaller, less expensive satellites that can be launched in larger quantities to enhance our current architecture performance against high value and fleeting targets.

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We're continuing to advance our ground-based processing techniques and algorithms. Our Sentient program—a "thinking" system that allows automated, multi-intelligence tipping and cueing at machine speeds—has been focused against many of our most challenging mission sets, resulting in new intelligence information that human-in-the-loop systems would have missed. Our Future Ground Architecture will leverage Sentient, and create an integrated cloud-based enterprise that will share tasking and intelligence products quickly across each of our ground sites, increasing both performance and resilience.

But the ability of the NRO to provide space-based collection is at risk. In February, this Committee was briefed by the IC and DoD on the current status of space threats. The NRO is aggressively developing the technical, operational, and architectural resiliency enhancements necessary to respond to those threats, and ensure our capabilities will continue to support our policy makers and warfighters.

#### **Our Shared Challenge**

Staying ahead of the adversaries who threaten our space capabilities is a challenge. Those adversaries are making space a priority, investing heavily, and accepting the risks necessary for rapid progress. The U.S. has not been keeping pace. I believe we have not made the investment that would indicate space is a priority—a fundamental—to the U.S. I believe the legislative and executive branches do not have the risk tolerance required to support rapid forward progress; our adversaries do. Our requirements, budget, and acquisition processes are disconnected, and none of them moves quickly. Failure is not well tolerated, even in the research and development activities required to keep our space capabilities relevant and vital,

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or to improve their resiliency. National Security Space is a team sport, and everyone on the team—those in the executive branch and the congress—must do all they can to advance its capabilities and improve its resilience to threats. We must have processes that are integrated, that move faster, and that demonstrate greater risk tolerance. We must re-commit to space as a National priority, and imperative. This Committee has been out in front, trying to drive the changes required. We at the NRO applaud your efforts and appreciate your continued support.

**Conclusion**

I am proud to represent the talented women and men of the NRO. It is our highly-skilled personnel who go above and beyond to deliver the NRO's mission of providing "Innovative Overhead Intelligence Systems for National Security." We will strive to develop, acquire, launch, and operate the increasingly capable and resilient systems required to meet the needs of all those we serve, from the highest level policymakers to the warfighters in harm's way. We are inspired by this Committee's efforts to address the barriers to the change—and the pace of change—required to advance national security space. We have the people with the talent, commitment, and passion necessary to take us forward—we only need to empower and enable them to succeed.

Mr. Chairman and members of the committee, thank you for your continued support of the National Reconnaissance Office, our People, and our mission.

**Betty J. Sapp**  
**Director, NRO**

(U) Betty Sapp was appointed the 18th Director of the National Reconnaissance Office (DNRO) on July 6, 2012. The DNRO provides direction, guidance, and supervision over all matters pertaining to the NRO and executes other authorities specifically delegated by the Secretary of Defense and the Director of National Intelligence.

(U) Ms. Sapp began her government career as a United States Air Force officer in a variety of acquisition and financial management positions, including: business management positions in the NRO; Program Element Monitor at the Pentagon for the MILSTAR system; Program Manager for the FLTSATCOM program at the Space and Missile Systems Center in Los Angeles; and manager of a joint-service development effort for the A-10 engine at Wright-Patterson Air Force Base in Dayton, Ohio.

(U) In 1997, Ms. Sapp joined the Central Intelligence Agency. She was assigned to the NRO where she served in a variety of senior management positions. In 2005, she was appointed the Deputy Director, NRO for Business Plans and Operations. As such, she was responsible for all NRO business functions, including current-year financial operations, preparation of auditable financial statements, business systems development, budget planning, cost estimating, contracting, as well as all executive and legislative liaison activities.

(U) In May 2007, Ms. Sapp was appointed the Deputy Under Secretary of Defense (Portfolio, Programs and Resources), Office of the Under Secretary of Defense for Intelligence. In this position, she was responsible for: executive oversight of the multibillion-dollar portfolio of defense intelligence-related acquisition programs; the planning, programming, budgeting and execution of the multibillion dollar Military Intelligence Program; and the technology efforts critical to satisfying both current and future warfighter needs.

(U) In April 2009, Ms. Sapp was appointed the Principal Deputy Director, National Reconnaissance Office (PDDNRO). As PDDNRO, she provided overall day-to-day management of the NRO, with decision responsibility as delegated by the DNRO.

(U) Ms. Sapp holds a Bachelor of Arts, and an MBA, Management, both from the University of Missouri, Columbia. She is also Level III certified in Government Acquisition and was certified as a Defense Financial Manager. Ms. Sapp is a native of St. Louis, Missouri, and now resides in Alexandria, Virginia.

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Statement for the Record  
before the  
House Armed Services Committee  
Subcommittee on Strategic Forces  
on the  
Fiscal Year 2018 Priorities and Posture of the National Security Space Enterprise  
Robert Cardillo  
Director, National Geospatial-Intelligence Agency  
19 May 2017

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**Introduction**

Chairman Rogers, Ranking Member Cooper and distinguished members of the Committee, on behalf of the women and men of the National Geospatial-Intelligence Agency (NGA) and the National System for Geospatial-Intelligence (NSG), I am pleased to testify before you today. NGA and our geospatial-intelligence (GEOINT) partners help decision makers, military commanders, and first responders understand what's happening at any given place and time, and anticipate what may happen next. I believe our motto says it all, "Know the earth, show the way, and understand the world." Individually and collectively, I can attest that we are fully committed to our Intelligence Community (IC) and Department of Defense (DOD) responsibilities and broader obligation to the nation's security.

NGA and our GEOINT partners across the national security community are critical to the IC's commitment to minimize surprise and enable decision advantage. We are routinely able to respond more dynamically than other traditional intelligence disciplines, as we have worldwide reach, increasingly persistent collection and systematic analytic access. With the explosion in publicly available information and non-traditional sources, the IC no longer has a monopoly on access or insight, but the IC is routinely asked to corroborate what is being reported and to put it into context of what we know about the evolving issue, to include the motives of the participants and the potential threats to our interests. Another of the ways GEOINT is able to contribute to favorable outcomes is by providing a less sensitive source from which to expose our knowledge and perspective on a situation or threat. Put another way, our customers look to NGA and our profession to create coherence out of chaos.

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NGA and our NSG partners, including the combatant commands (CCMDs) and the service agencies, are integral players in operations to degrade and disrupt the ability of terrorist organizations. Every day, our analysts support our government's antiterrorism activities around the world.

The contested regions of Iraq and Syria are host to a web of competing interests, conflicting parties, and complex alliances. GEOINT contributes to our understanding of the actions which players undertake – such as advances of state-actors into neighboring states, the provision of lethal aid and assistance to favored factions, and the underlying terrain, human geography and physical and economic infrastructure. By continuously monitoring these targets, we provide warning, detect and describe operations, and enable policymakers and operators to pursue responses which serve our interests and minimize our exposure to threats. This includes monitoring Syria and ISIS's response to actions by traditional state actors, such as Russia, Iran, and Turkey, as well as non-state actors, such as Hezbollah, Shiite militias, and Kurdish militias.

#### **Strengthening GEOINT Space Enterprise**

In addition to serving as the Director of NGA, I serve as the Functional Manager of the NSG. In order to ensure the DOD and IC are postured to address today's critical intelligence missions, I synchronize operations to realize a professional, interoperable, agile, and integrated GEONT enterprise. Functional Management initiatives include: *Analytic Modernization* to establish a common framework to harness technology, data, analytic strategies and tradecraft to provide on-demand information; *Cloud Migration* to enable our GEOINT enterprise to consolidate and share critical resources and data to

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facilitate user access and meet mission needs; *Commercial GEOINT* to embrace new and diverse sources of information, techniques, and tools; *Enterprise Capabilities* to formulate GEOINT needs derived from inputs across the enterprise; *Mission Governance* to synchronize GEOINT operations to meet priority requirements; *Safety of Navigation* to meet the growing demand for this core mission by leveraging the full array of current and emerging capabilities; *Standards* to discover and share GEOINT content from all sources; and *Certification* to create a trusted workplace of GEOINT professionals with universally recognized skills.

In my role as Functional Manager, I also ensure CCMD needs are met through future overhead architecture. More specifically, the GEOINT Enterprise Capability Document (ECD) serves as a framework for translating Critical Intelligence Needs into the key enterprise functions and capabilities our analysts require to solve our most vexing challenges. By leveraging existing national, military and commercial GEOINT sources and guiding the development of future capabilities, the ECD ultimately advances GEOINT collection, characterization, automation, and anticipatory analysis. The ECD advances my effort to lead enterprise-level priorities, orchestrate the capabilities necessary to create, acquire and broker GEOINT content and differentiate GEOINT as an activity-based, anticipatory and predictive intelligence discipline.

#### **Global Persistent GEOINT**

Global Persistent GEOINT enables NGA to provide national and tactical leaders the intelligence and early warning needed for decision advantage. It also supports the CCMDs in holding key strategic targets in their assigned Areas of Responsibility at risk.

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It leverages the exquisite capabilities of the National Reconnaissance Office (NRO) through dynamic, model-driven collection that accelerates data to answers, increases NGA's investments in the commercial sector, and integrates the capabilities of international partners to fill intelligence gaps and provide early warning needed for decision advantage.

**Automating the GEOINT Enterprise for Advanced Analytics**

The explosion of available data is causing the GEOINT discipline to grow beyond the limits of human interpretation and explanation, which diminishes the comparative advantage current collection provides. By embracing the use of algorithms, automated processing, machine-to-machine learning and artificial intelligence, NGA will advance GEOINT tradecraft with human-machine collaboration, near real-time analysis and the ability to anticipate behaviors to provide us a new advantage.

By combining all of the data now available to us with these new technological advancements, we have the opportunity to serve the nation better than ever before. We believe that technology will allow us to automate as much as 75% or more of the rote activities that our personnel perform manually today, freeing them to spend more time focused on hard intelligence questions. Getting to that point will require significant investments in our IT architecture, as well as in our Research and Development, allowing our best and brightest to apply their brainpower to analyzing volumes of data that would be too large for them to deal with on their own.

**Commercial GEOINT Activity**

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Conservative estimates over the next ten years predict that some 9000 commercial satellites, large and small, will be launched, compared to fewer than 1500 in the last ten years. The crowded global space arena, supported by increased technology, commercial investment, and reduced launch costs, continues to develop new space-enabled capabilities and space situational awareness across the international community space-based services to include imagery, weather, communications, missile warning, targeting, and positioning, navigation, and timing.

In response to the wave of emerging commercial imagery providers, NGA began engaging with the most mature of these "new space" providers to assess mission utility and possible access to operational data and services. We quickly realized that working jointly on this with our NRO mission partner affords both agencies the best opportunity to take full advantage of new and emerging commercial GEOINT capabilities to satisfy mission needs. Together, we stood up the joint Commercial GEOINT Activity (CGA), whereby NGA and NRO are working more closely than ever before to identify and evaluate emerging commercial GEOINT data and services against customer requirements. CGA serves as the focal point for engagement with our industry partners to understand and assess emerging commercial capabilities for technical feasibility and mission utility. Based on these assessments, CGA will recommend strategic investments that will deliver a more diverse, efficient and cost effective mix of commercial and national overhead architecture, imagery, and services; thereby breeding success in new and open capabilities.

Succeeding in and with the open also means looking not just at new sources, but also at new forms of data. Most recently, NGA has been using publicly available

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information such as social media data, together with geospatial information to anticipate hostile actions to US or Allied interests, and provide a fully integrated intelligence picture. Unclassified, open, and nontraditional data are overtaking traditional classified data in volume and velocity.

In short, we must go wherever the data exist, and apply data wherever the mission demands. While NGA has made great strides in successfully leveraging commercial imagery and other open sources to achieve our mission, NGA's architecture, tradecraft and training, standards, governance, and culture remain optimized for classified GEOINT content. To truly succeed in the open, NGA must lead the IC in overcoming our historic reluctance to allow analysts to engage externally and embrace the ever-expanding private marketplace. Open content will be embraced with the same fervor as classified content, and in many cases, we will use open content first and augment with classified sources to reject, confirm, or increase confidence in analytic judgments.

**NSG Open Mapping Enclave (NOME)**

NOME is an online toolkit that allows the NSG to contribute and benefit from the power of open content, also known as Volunteered Geographic Information (VGI). As a crowdsourcing method to harnesses tools to create, assemble, and disseminate geographical data provided voluntarily by individuals, crowdsourcing products such as Wikipedia and OpenStreetMap are collecting useful geospatial information for our analysts to produce GEOINT products.

By allowing potentially thousands of users to contribute their expert knowledge to

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maps, VGI opens up geospatial data to communities that in the past would have had to rely on their own limited collection resources and proprietary technologies. NOME is challenging conventional geospatial collection and dissemination methods to reduce costs, improve accuracy, and enhance mission planning and execution.

**Conclusion**

In closing, with your continued support, NGA will strengthen our Functional Management responsibilities, pursue Global Persistent GEOINT, automate the GEOINT enterprise in order to support advanced analytics, and sustain our commercial GEOINT activity.

On behalf of the women and men of NGA and the GEOINT community, thank you for your continued support. I'm pleased to answer any questions that you may have.

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**Robert Cardillo**  
**Director, NGA**

Mr. Robert Cardillo is the sixth Director of the National Geospatial-Intelligence Agency (NGA). Mr. Cardillo leads and directs NGA under the authorities of the Secretary of Defense and Director of National Intelligence. He became NGA's director on Oct. 3, 2014.

Prior to this assignment, Mr. Cardillo served as the first Deputy Director for Intelligence Integration, Office of the Director of National Intelligence, from 2010 to 2014. In addition, he served as the Deputy Director of the Defense Intelligence Agency (DIA) and the Deputy Director for Analysis, DIA, from 2006 to 2010. In the summer of 2009, Mr. Cardillo served as the Acting J2, a first for a civilian, in support of the Chairman of the Joint Chiefs of Staff. Before he moved to DIA, Mr. Cardillo led Analysis and Production as well as Source Operations and Management at NGA from 2002 to 2006. Mr. Cardillo's leadership assignments at NGA also included Congressional Affairs, Public Affairs, and Corporate Relations.

Mr. Cardillo began his career with DIA in 1983 as an imagery analyst, and he was selected to the Senior Executive Service in 2000. Mr. Cardillo earned a Bachelor of Arts in Government from Cornell University in 1983 and a Master of Arts in National Security Studies from Georgetown University in 1988.

Mr. Cardillo is the recipient of the Director of National Intelligence Distinguished Service Medal, the Presidential Rank of Distinguished Executive, the Presidential Rank of Meritorious Executive, and the Chairman of the Joint Chiefs of Staff Joint Meritorious Civilian Service Award.

Mr. Cardillo resides in Northern Virginia with his wife. They have three children and two grandchildren.

NOT FOR PUBLICATION UNTIL RELEASED BY  
THE HOUSE COMMITTEE ON ARMED SERVICES

STATEMENT OF  
JOHN D. HILL  
ACTING DEPUTY ASSISTANT SECRETARY OF DEFENSE FOR SPACE POLICY

BEFORE THE  
STRATEGIC FORCES SUBCOMMITTEE OF THE  
HOUSE OF REPRESENTATIVES COMMITTEE ON ARMED SERVICES

FISCAL YEAR 2018 PRIORITIES AND POSTURE OF  
THE NATIONAL SECURITY SPACE ENTERPRISE

MAY 19, 2017

Chairman Rogers, Ranking Member Cooper, distinguished members of the committee, thank you for the opportunity to testify today on national security space strategy. I request the committee accept my statement for the record.

As this committee has highlighted on many occasions in recent years, the United States faces unprecedented changes in the nature of security within the space domain. Moreover, the interconnected nature of all domains – space, cyber, air, maritime, and land – means these changes have multi-domain implications that are fundamental to the nature of deterrence and warfare in the 21<sup>st</sup> century, at both the conventional and nuclear levels. Understanding these implications is critical as this administration prepares the President’s new National Security Strategy and the National Defense Strategy and as Congress carries out its responsibilities for oversight and funding of the programs and activities necessary to realize those strategies.

No less important, we must also recognize, as this committee has underscored on many occasions, that strategic success requires additional resources and an end to the years-long pattern of extended continuing resolutions, and a return to a normal process of annual appropriations. Secretary Mattis has committed the Department of Defense to work in concert with congressional leaders to raise the national defense cap. Accomplishing that objective would return Congress to its active oversight role instead of relying on non-strategic and self-destructive cuts, and would enable the Department to act on the basis of sound strategic planning. Failure to reverse sequestration or to end the pernicious cycle of lengthy continuing resolutions would bring about the need to recalibrate our approach to asserting U.S. influence around the world, and even call into question the integrity of many U.S. strategic interests.

Today, we consider our space security strategy in an era in which Russia and China present new challenges to U.S. interests and seek veto power over the economic, diplomatic, and

security decisions of nations on their periphery. A common element in their approaches is to develop anti-access/area-denial capabilities intended to prevent or counter U.S. intervention in crises or conflicts. In short, these approaches aim to undercut our ability to secure our interests, which includes standing by the international commitments we have made especially to our treaty allies in NATO and the Asia-Pacific region. As Director of National Intelligence Coats recently testified, “We assess that Russia and China perceive a need to offset any U.S. military advantage derived from military, civil, or commercial space systems and are increasingly considering attacks against satellite systems as part of their future warfare doctrine. Both will continue to pursue a full range of anti-satellite (ASAT) weapons as a means to reduce U.S. military effectiveness.”

Diplomatic solutions remain our preferred option to settling the differences that sometimes divide nations, but U.S. diplomatic influence rests on the credibility and capability of our military power, which is fundamental to deterrence and to the confidence of our allies and partners in knowing that they do not have to submit to the coercive pressures of large and powerful neighbors.

America’s space posture enables the ability of the U.S. military to project power globally, respond to crises rapidly, strike swiftly and precisely, and command forces in multiple theaters of operation simultaneously. Those capabilities are at the heart of the ability of the United States to deter conflict by imposing unacceptable costs on an aggressor. They support our deterrent capabilities at the conventional and nuclear levels. Potential adversaries have understood this for many years, and they have likewise observed that the great majority of space systems on orbit today were developed for an environment that, aside from natural threats, was relatively benign. This high reliance on systems that are perceived as relatively vulnerable is destabilizing and has

led some military observers to conclude that, in times of conflict, attacking U.S. military space systems may make an irresistible and most tempting choice. Disabusing people of such misguided notions is a strategic priority for our national security space community.

Now, it is essential that we understand that the threats in space are not independent of terrestrial threats, but are fundamentally extensions of those threats. There is scant evidence that any nation is interested in conflict in space for its own sake. And there is widespread recognition that war in space could have disastrous effects for all nations, not just the belligerents. Nonetheless, some nations have concluded that there is great military advantage to be achieved through early attacks on space-based capabilities, especially if those attacks are plausibly deniable. Further, these nations conclude that if they can obtain that early advantage in space, then they can shift the terrestrial military balance in their favor and use armed forces to achieve their terrestrial objectives.

This is why in the Department of Defense we are making such a concerted effort to strengthen the mission assurance of our space-based capabilities, including their associated ground systems, and to deny aggressors the benefits and the plausible deniability they seek through attacks in space. You are seeing this priority in our budgets and in changes we are making to develop the doctrine, the operational tactics, techniques, and procedures, and the skilled personnel necessary to survive and prevail in a contested space domain. Not only are we investing in improvements to the inherent resilience of individual systems and in space control capabilities, but we are also making investments in foundational capabilities like space situational awareness systems and our space command and control systems.

You are also seeing changes in our attitude about how to acquire necessary capabilities. These are not problems that the government will solve on its own. More and more, the

commercial sector is driving innovation in the space domain, and the Department of Defense is striving to take advantage of this great American strength to improve our capabilities, improve our mission assurance, and reduce costs across the range of space mission areas. From space launch, to wideband communications, to space situational awareness, to satellite operations, to remote sensing and more, we must continuously challenge ourselves to identify innovative ways of harnessing civil and commercial solutions that expand our capabilities, diversify our risks, and assure our missions. As has been the case in so many other fields, leveraging civil and commercial innovation must be at the heart of our strategy.

It is also important to remember that the United States is not alone in this effort. U.S. allies and partners are likewise very concerned about the threats to their national security that emanate from the contested nature of space. And they are eager to work with us on this common challenge to our common defense. International cooperation is never easy, and in the space arena must overcome longstanding institutional biases that favor national programs. But just as we are able to employ common systems and operate in coalitions in the other domains, so too must we develop and normalize these patterns of behavior and reap the associated operational and strategic benefits in our approach to the space domain. This requires cultural change, and in bureaucracies cultural change requires top-down persistence, which the Secretary of Defense and our Air Force leadership and Commanders are providing. Earlier this year we completed a new International Space Cooperation Strategy that lays out approaches to expand the benefits of international cooperation in areas ranging from our operations, to our research and development, to our acquisition, to strategic planning, and even to our understanding of how the law of war applies in a domain that most people have assumed was benign. We are increasing the focus on space in longstanding exercises and wargames with our allies, and increasing allied participation

in our space-focused games and exercises. We are increasing the exchanges of personnel. And in a first-of-its-kind initiative, we now have more than a dozen allies participating in the ongoing Analysis of Alternatives for Wideband Communications Services, where we are taking allied and commercial supply and demand considerations into full account. We have a long way to go before we will fully realize the potential benefits of our alliances and partnerships with respect to the space domain, but we have taken the first steps.

Our priorities also include working with Congress on a number of space policy issues. In particular, I want to highlight the rapid growth of space traffic, which has led many to ask whether the time has come for a civil approach to space traffic management. In the Department of Defense, we welcome that discussion. For although we provide basic forms of space traffic monitoring and space situational awareness support to operators around the world in accordance with our authorities, we are not a regulatory agency and we do not optimize our space surveillance network for those tasks, nor should we. There are credible proposals for commercial satellite communications and remote sensing constellations that number in the thousands of spacecraft. The rapid past and projected growth of space traffic that is already taking place makes it imperative for all space operators – commercial, civil, and national security – to come together before we have more collisions in space and to identify a more suitable approach for managing space traffic that continues to spur economic growth, investor confidence, and technological innovation, while also assuring the safety of space flight and the sustainability of the space environment. Congress is an essential player in that effort. Eventually, this needs to be an international effort, and indeed international companies are already undertaking some informal efforts on their own. But the United States has deep interests in this arena, and we in government have a responsibility to lead.

Finally, I want to address an issue that this committee has prioritized, which is the organization of national security space. The Department of Defense takes very seriously the concerns this committee has appropriately raised regarding the organization, management, and leadership of space within the Department of Defense. Given the dynamism of the threat, it is only natural and appropriate that we ensure we are doing everything we must to outpace the threat. And that includes examining ourselves honestly to ensure we have the correct alignments of authority, responsibility, and accountability; to identify necessary changes; and to work with the White House and Congress to implement them. This question has the attention of the Secretary and the Deputy Secretary of Defense. They expect to be presented with sound analysis and a full range of options, and they mean for us to meet the deadline of reporting to you and our other oversight committees this June. I anticipate this topic will be an area of continuing discussion with Congress in the months ahead as we work together to get this right.

In conclusion, I want to thank this committee for keeping the challenges of securing space before the public and for consistently pressing us to think harder about the strategic challenges in space that our nation faces. The United States and all of our neighbors on this relatively small planet are inextricably linked by a common interest in avoiding wars that extend to space. Yet we know that the history of our species is a history that has seen war follow us wherever we have gone. And every year, as our global community increases its dependence on services from space, the societal costs of a possible war in space continue to mount. Our national security establishment is no different from civil society in its dependence on space. But by denying aggressors the benefits of attacks in space, the national security community has the unique responsibility and capability to reduce the likelihood that wars will begin in or extend to space. And that in turn can reduce the benefits that aggressors may see in resorting to armed

conflict, and increase the likelihood that nations will choose to settle their differences by peaceful means. I look forward to working with this committee to ensure that we have the right strategy and the necessary programs, posture, and organizational structures to achieve those outcomes.

**John D. Hill**  
**Deputy Assistant Secretary of Defense for**  
**Space Policy (Acting)**

Mr. John D. Hill became the Principal Director for Space Policy in November 2013, and is currently the Acting Deputy Assistant Secretary of Defense for Space Policy, with responsibilities for formulating and coordinating space-related national security and defense policies and strategies, including for the conduct of international space cooperation.

A member of the career Senior Executive Service since 2007, Mr. Hill has fulfilled a wide variety of assignments in the Department of Defense (DoD). Prior to his current assignment, he served as DoD's representative in negotiations with Afghanistan on the Security and Defense Cooperation Agreement that enables a continuing presence of United States forces. Mr. Hill has held two prior Principal Director positions in DoD, overseeing defense policies and programs regarding Afghanistan, Pakistan, and Central Asia from 2010-2012, and holding similar responsibilities regarding the East Asia region from 2006-2010.

In previous assignments as the Director for Northeast Asia and as the Senior Country Director for Japan, Mr. Hill led DoD's management of U.S. alliance relationships with Japan and the Republic of Korea and oversaw security policies regarding the Korean Peninsula.

Mr. Hill's career includes extensive experience across a wide range of international negotiations encompassing defense posture, status of forces, nuclear non-proliferation, defense industrial collaboration, international trade, and host nation support agreements. His early career highlights included roles in developing the longstanding U.S. policy on offsets in military exports and development and implementation of the Gulf War program under which coalition partners contributed \$53 billion to defray U.S. costs.

As a member of the inaugural class of Mansfield Fellows, Mr. Hill served assignments on detail to the Japan Defense Agency, the Japan Federation of Economic Organizations (Keidanren), and Japan's Ministry of International Trade and Industry.

Mr. Hill joined DoD through selection to the Presidential Management Internship Program, serving assignments with the Army Security Assistance Command, the Office of Management and Budget, and the Office of the Secretary of Defense.

Mr. Hill received his Master of Arts in International Affairs from American University, and earned a Bachelor of Arts in Political Science at UCLA. He and his wife Lynn live in Fairfax, Virginia. They have three grown daughters.



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**QUESTIONS SUBMITTED BY MEMBERS POST HEARING**

MAY 19, 2017

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#### QUESTIONS SUBMITTED BY MR. ROGERS

Mr. ROGERS. General Raymond—there was a recent Washington Post article which reported on a company called Ligado, which prior to a restructure was called Lightsquared, and its plan to build a wireless network with ground and satellite based systems. Have the issues pertaining to GPS been resolved and what are the economic/national security risks if we get this wrong?

General RAYMOND. No, the issues pertaining to Ligado and GPS have not been resolved. The bottom line is that the preliminary results of Department of Transportation's Adjacent Band Compatibility Testing indicates that the proximity of the Ligado proposed network to the primary GPS L1 frequency band results in interference the Air Force, Department of Defense and other U.S. government agencies believe is unacceptable. If we get this wrong, the network will degrade the performance of numerous GPS-based applications to include but not limited to important national defense, science, transportation, agriculture, banking, communications (e.g., broadband wireless & cellular services), health and safety, and environmental systems. This will directly impact the economic well-being of the nation and severely limit the development of GPS applications in the future. The Ligado proposal is a direct challenge to those applications' use of GPS technology and is inconsistent with the National Space Policy direction to sustain the radiofrequency environment in which critical U.S. space systems operate.

#### QUESTIONS SUBMITTED BY MR. FRANKS

Mr. FRANKS. Is it fair to say some of our near-peer adversaries' offensive space capabilities have outpaced our ability to defend our space assets?

Do you believe the Air Force as an institution has placed the appropriate amount of resources and focus on space commensurate to the current and emerging threats?

Do you see value in establishing an annual capstone training/exercise, or "Space Flag" event for space operators (similar to Red Flag)?

General RAYMOND. Near peer adversaries have not outpaced our ability to defend our space assets today, but I am concerned about the future. Our adversaries are rapidly developing capabilities that will be able to hold every U.S. space asset in every orbital regime at risk in the not too distant future. We need to take action now to address our vulnerabilities, so your assertion does not become a true statement in the future.

Unfortunately, the Air Force is facing critical shortfalls in readiness and modernization in every one of its mission areas; space is one of them. At the same time we are trying to grow cyber capabilities and recapitalize fighters, bombers, mobility and nuclear forces, we must find a way to restructure our space architectures to create resilient systems that can be better protected and defended as an enterprise. All of these things are important national priorities. The Air Force is asking for a 20 percent increase in space funding in the FY18 budget request and will need similar increases in future years. However, with all of the budget shortfalls the Air Force faces we have to consider the possibility that that the Air Force alone cannot afford to make the investment needed to transform our space enterprise to operate effectively in a contested environment; we may need to look at national funding sources that are beyond what the Air Force alone is able to provide.

Absolutely, the effort is already underway to provide tactical-level training focused on evolving threats leveraging knowledge gained during rounds of experimentation at the National Space Defense Center. The first Space Flag was conducted 17–21 April 2017 at Schriever AFB, CO. It was a successful, computer assisted exercise that included four operational space squadrons, the National Space Defense Center, the Joint Space Operations Center and several other associated organizations. Our vision and intent is to grow Space Flag to become the comprehensive, robust event that trains our Airmen similar to Red Flag. We will continue building upon the initial Space Flag to create an environment where the space enterprise can come together and exercise our toughest scenarios and challenges against a thinking adversary in a safe and realistic manner.

Mr. FRANKS. Do you believe it is fair to say space has been weaponized?

Do you believe we need a more robust defensive sensor layer to adequately identify the latest and emerging threats to our space assets?

General RAYMOND. Space is a contested warfighting domain, just like land, air, sea and cyberspace. As a nation we need to embrace this fact. We need to be prepared to use multi-domain capabilities to protect our space systems. If we fall short protecting against threats in space, the effect will certainly be felt across all warfighting domains.

Yes, we need a more robust defensive sensor layer to adequately address the threat to our space assets. This is one on my top priorities. Today we are leveraging our existing space surveillance capabilities and are developing new capabilities such as the Space Fence, as well as expanding our partnership with the NRO. We also continue to enhance situational awareness sharing partnerships to provide us additional space surveillance data. Finally, we are developing a battle management command and control system which will allow us to more fully leverage additional data sources from commercial capabilities to high end intelligence data.

Mr. FRANKS. Should the U.S. treat space as a warfighting domain?

Should the U.S. develop defensive capabilities to counter kinetic attacks against our space security architecture?

General RAYMOND. Yes. I stand by my opening statement to the committee: "Today, in no uncertain terms, space is a war fighting domain just like air, land and sea. Potential adversaries are developing capabilities to deny us access to and the benefits of the space domain. Let me be very clear, we do not want a conflict that extends into space. But one way to keep that from happening is to make sure that we're prepared for it and be able to fight and win that conflict if it were to occur."

We are already investing in systems to improve the space situational awareness that is foundational for defense to include Space Based Surveillance System and Geosynchronous Space Situational Awareness Program and Space Fence. We are also taking steps to build more on-board and off-board protection capabilities into our future systems to make them more resilient against both kinetic and non-kinetic threats.

Mr. FRANKS. Is it fair to say some of our near-peer adversaries' offensive space capabilities have outpaced our ability to defend our space assets?

General BUCK. The pace at which potential near-peer adversaries are pursuing capabilities to deny US advantages in space is certainly concerning and I see no slowing in the future. Potential adversary capabilities have yet to eclipse our ability to defend; however, our architectures and systems were designed in and for an era without such threats. We must continue to train our forces and field new systems with an eye to maintain our edge in today's contested, degraded and operationally-limited environment. And, we must do so faster than our adversaries can adapt, which means our acquisitions cycles must be nimble enough to bring capabilities to the fight on operationally-relevant timelines.

Mr. FRANKS. Do you believe the Air Force as an institution has placed the appropriate amount of resources and focus on space commensurate to the current and emerging threats?

General BUCK. We are in the midst of a significant shift in the DOD space enterprise; moving from a service-provider mindset to operational warfighter mindset. As we make this shift, we have identified several areas that require added focus to ensure they meet the demands of maintaining freedom of action in space. Beyond organizational changes, these areas include space intelligence support, robust battle management command and control and space situational awareness capabilities and ensuring we have the right authorities and rules of engagement in place. We are making strides in these areas; however, the budgetary uncertainty driven by sequestration and past shortfalls makes addressing the challenges more difficult.

Mr. FRANKS. Do you see value in establishing an annual capstone training/exercise, or "Space Flag" event for space operators (similar to Red Flag)?

General BUCK. Absolutely, yes. Training our space warfighters to operate in a contested, degraded and operationally-limited environment is vital. Such advanced training is foundational to our Space Mission Force construct and underpins our push to normalize operations. As we normalize space operations, we must also balance the need to stress and train our own space crew forces with the need to practice how we synchronize space operations and effects into large-scale exercise planning and execution.

Mr. FRANKS. Do you believe it is fair to say space has been weaponized?

General BUCK. We have no desire to weaponize space and we are working hard to ensure no country believes they can gain an advantage by extending a conflict to space. A conflict which extends to space is in no one's best interest and would have drastic and enduring second and third order economic effects, not just on the

U.S., but on the entire world. But, it is certainly clear that potential adversaries are developing systems with the sole intent to destroy, deny or degrade DOD space systems. It's important to understand that like all nations we have the inherent right of self-defense, so purposeful interference with space assets vital to our national security will be met by all necessary means. No one wants a war in space. The best way to avoid such conflict ... to deter future adversaries ... is to always be prepared to protect and defend unfettered access in, through and from space.

Mr. FRANKS. Do you believe we need a more robust defensive sensor layer to adequately identify the latest and emerging threats to our space assets?

General BUCK. Yes, and what is critical at this juncture is to ensure the enterprise on the whole is capable of responding to emerging threats. This includes the right architectures, the right CONOPS and definitely the capabilities necessary to identify threats in order to defend our space assets. This is where it is imperative to improve our capabilities for space intelligence and indications & warnings and battle management command and control systems.

Mr. FRANKS. Should the U.S. treat space as a warfighting domain?

General BUCK. Yes, space is a warfighting domain, fundamentally no different than land, air or sea. It is clear by potential adversary actions that we must be prepared to protect and defend the space joint operating area. But, there is no space war, just war and normalize space operations is critical to maintaining freedom of action in, through and from space.

Mr. FRANKS. Should the U.S. develop defensive capabilities to counter kinetic attacks against our space security architecture?

General BUCK. Yes, and space situational awareness capabilities are the cornerstone of defending our space assets. We must continue to pursue SSA capabilities that go beyond satellite catalog maintenance and move to joint warfighting battlespace awareness capabilities.

Mr. FRANKS. Is it fair to say some of our near-peer adversaries' offensive space capabilities have outpaced our ability to defend our space assets?

Do you believe the Air Force as an institution has placed the appropriate amount of resources and focus on space commensurate to the current and emerging threats?

Do you see value in establishing an annual capstone training/exercise, or "Space Flag" event for space operators (similar to Red Flag)?

Mr. HILL. Russia and China are continuing to pursue a full range of anti-satellite weapons that are designed to reduce U.S. military effectiveness, and both countries are increasingly considering attacks against satellite systems as part of their future warfare doctrine. As such, maintaining the advantages U.S. forces derive from space requires unprecedented mission-assurance efforts. This must include more resilient architectures, measures to improve the defense of our space assets, and the ability to reconstitute lost capabilities on operational timelines. These counterspace challenges began to emerge in the late 1990s. Although the Department of Defense was initially slow to respond, efforts in recent years have greatly increased the focus and resources applied to the task. Nevertheless, we must all recognize that the growing threats to space systems and capabilities are an enduring condition of modern warfare, requiring that we sustain and reinforce those mission assurance efforts in the years ahead in order to sustain our advantages.

Mr. FRANKS. Do you believe it is fair to say space has been weaponized?

Do you believe we need a more robust defensive sensor layer to adequately identify the latest and emerging threats to our space assets?

Mr. HILL. It is fair to say that the space domain and space-based capabilities are fully intertwined with the other domains in modern warfare, and that we must take the necessary steps to protect and defend the important assets deployed in space. Just as we place sensors in space and other domains to help us understand threats and to predict and attribute developments in the terrestrial battlespace, so too does defense of our space-based capabilities require that we improve our sensor networks, both space-based and terrestrial-based, to understand threats and to predict and attribute activities in the space domain.

Mr. FRANKS. Should the U.S. treat space as a warfighting domain?

Should the U.S. develop defensive capabilities to counter kinetic attacks against our space security architecture?

Mr. HILL. Yes, the United States should and does treat space as a warfighting domain. The Department of Defense is taking appropriate measures to assure the missions that our space-based capabilities support in the face of growing counterspace threats, such as kinetic attacks.

# **QUESTIONS SUBMITTED BY MR. LAMBORN**

Mr. LAMBORN. I understand that there have been delays in the Air Force's Pathfinder 2 initiative due to property management and appropriations law constraints related to the use of transponders and satellite bandwidth. To what extent could these delays be avoided with more flexible spending authority? What is the timeline for completion of Pathfinder 2 and Pathfinder 3?

General RAYMOND. The flexibility to use Procurement funds for acquiring commercial communication services, in addition to the ability to buy a fully funded end item, would have been beneficial to awarding Pathfinder #2 earlier than currently planned. As a result of the appropriations law and property management challenges, several Pathfinder #2 objectives were deferred to Pathfinders #3 and #4. COMSATCOM Pathfinder #2 is on track to complete all award activities in 1QFY18. COMSATCOM Pathfinder #3, which is utilizing an OTA, is on track to award in 4QFY17.

Mr. LAMBORN. As you know, satellite communications have never been more vital to the security of our nation or come under such assault. To address the cyber threats to our satellite communications and accelerate adoption of built-in cyber defenses, the Department developed information assurance requirements for commercial providers. To what extent does the Department use information assurance criteria in its evaluation and acquisition of COMSATCOM? What is the process for evaluating commercial suppliers' information assurance capabilities?

General RAYMOND. To address cybersecurity in our use of commercial providers for satellite communications, Space and Missile Systems Center (SMC) and Defense Information Systems Agency (DISA) efforts use DISA's cyber Risk Management Framework (RMF) to assess risk during source selection. The RMF consists of an extensive set of cybersecurity questions that the bidder must address. In evaluating industry responses, a pass/fail assessment for information assurance is determined against the industry responses to the RMF questions. SMC invites a DISA member, familiar with their cyber RMF, to participate in the source selection and this member determines the pass/fail assessment. United States Strategic Command has appointed DISA as the Authorizing Official (AO) for DOD Commercial Satellite Communications (COMSATCOM) systems. DISA has extensive experience evaluating cybersecurity for leased COMSATCOM services and coordinates these assessments with their customers to ensure the customer is aware of any risks and can implement proper mitigations. SMC is leveraging DISA and National Security Agency (NSA) practices in the procurement of commercial products under the COMSATCOM Pathfinder and Pilot efforts.

Mr. LAMBORN. What steps for the new EBMC2 program or other related efforts (e.g., market research, acquisitions, demonstrations, evaluations, exercises, experiments, prototypes, proof of concepts, pilots, numerical validations, operations, etc.) has the USAF taken to identify commercial SSA/BMC2 software capabilities and services that can, in whole or in part, help satisfy the USAF's needs for improved SSA and BMC2?

General RAYMOND. Air Force Space Command has taken several steps to identify commercial SSA/BMC2 software capabilities and services that can, in whole or in part, help satisfy the USAF's need for improved SSA and BMC2. First, the Space and Missile Systems Center released a Request for Information on a broad range of Enterprise Space BMC2 (ESBMC2) requirements in January 2017 that resulted in 26 industry responses. No single commercial company stated that they have the capabilities to address the full set of mission and infrastructure requirements for ESBMC2. Therefore, SMC is refining the acquisition strategy that will enable rapid integration of multiple commercial, defense industry, and government solutions to meet requirements. Our goal is to complete this overarching acquisition strategy by December 2017. The strategy will incorporate preceding operational prototype capabilities from the BMC2 Joint Emergent Operational Need (JEON) and Air Force Rapid Capabilities Office and create an enduring rapid application delivery process that will incorporate the best capabilities from commercial and defense industry.

Mr. LAMBORN. Have any commercial SSA/BMC2 software capabilities and services been identified that will help satisfy the USAF's needs for improved SSA and BMC2?

General RAYMOND. Yes, Air Force Space Command has taken several steps to identify commercial SSA/BMC2 software capabilities and services that can, in whole or in part, help satisfy the Air Force's need for improved SSA and BMC2. First, the Space and Missile Systems Center released a Request for Information on a broad range of Enterprise Space BMC2 (ESBMC2) requirements in January 2017 that resulted in 26 industry responses. While no single commercial company stated that they have the capabilities to address the full set of mission and infrastructure re-

quirements for ESBMC2, commercial services exist that can address some of our requirements. Second, the Space and Missile Systems Center released a Broad Area Announcement (BAA) on 22 May 2017 seeking capabilities from Commercial and Defense Industry to address technology maturation concepts for the broad range of Enterprise Space BMC2 requirements. Third, AFSPC is independently validating and verifying several commercial data providers to augment the Space Surveillance Network via the Non-Traditional Data Pre-Processor (NDPP) program. Finally, SMC is also implementing several commercial SSA capabilities as part of the Joint Space Operations Center Mission System Increment 2 effort.

Mr. LAMBORN. In all of its efforts, including the RCO program and consortium, what is the USAF's plan to prioritize the use of commercial SSA/BMC2 software capabilities and services to the maximum extent practicable first before then filling in any remaining operational gaps with government prototyping and redevelopment for the truly unique military requirements that don't reside in the commercial marketplace? How is this prioritization reflected in the USAF's current FY17 funding plan as well as in the proposed FY18 budget going forward through the FYDP?

General RAYMOND. In the USAF's current FY17 funding plan as well as in the proposed FY18 budget going forward through the FYDP, the Air Force will first leverage, to the maximum extent practicable, commercial tools in all areas where they cost-effectively meet government requirements to include mission requirements, resiliency, supportability, and cybersecurity. This includes support for improved space situational awareness, satellite control, and event analysis. In the FY17 and FY18 ESBMC2 execution plan, the Air Force is pursuing commercial and defense industry technologies via a Broad Agency Announcement (BAA) which posted to Federal Business Opportunities on 22 May 2017. This BAA continues for five years. In FY17 and FY18, efforts under the AFRL-led BMC2 JEON will continue to evaluate commercial and other applications that improve decision timeliness, decision quality and the ability to handle simultaneous adversary actions. Infrastructure elements and software applications, regardless of origin, that provide the most capability improvement will receive priority. Recent market research has identified numerous commercial solutions that address subsets of the battle management and command and control requirements. The Air Force plans to further work with the commercial vendors of these solutions to assess if they meet requirements and then rapidly integrate them into a multi-level, cyber defensible network to achieve initial capabilities. As we operationally identify improvements needed to the existing capabilities and gaps in overall capability, we will aggressively pursue Other Transaction Authority and other contractual vehicles that enable the Air Force to pursue a commercial DevOps software development model. This model will enable us to push commercial vendors to improve existing and build new products that satisfy known and evolving requirements for BMC2. In concert with the rapid software development and fielding, SMC will fulfill their enterprise management role by building the logistical tail required to support this construct.

Mr. LAMBORN. Given that the USAF continues to not follow this prioritization on the JMS program, under the JEON, and with the NDPP, what steps are being taken to change this and ensure AFSPC, SMC, AFRL, RCO and all other supporting organizations follow through on this prioritization?

General RAYMOND. JMS brought in commercial capabilities for event processing (reentry, closely-spaced objects, launch, deorbit, breakup), and event generation for training and exercises. JMS also evaluated commercial capabilities for catalog processing, but did not incorporate either commercial capability because they did not meet accuracy performance requirements. ESBMC2 will incorporate additional commercial processing as part of the planned multi-hypothesis event analysis capabilities. The AFRL JEON is planning to add additional commercial vendors to the team via a formal procurement process. This will allow additional commercial capabilities to be incorporated. The Non-Traditional Data Pre-Processor (NDPP) effort, once operationally accepted in July 2017, will be a conduit for accessing data sources to perform several functions. These include:

1. Use of commercial data and non-traditional data (IC, commercial, academia, foreign, etc.)
2. Establishment of data standards
3. Application of cyber resilience and protection requirements
4. Enabling of operational test for future sensors

The RCO Prototype and SMC efforts are conducting market research for their activities. These efforts will consider all proposed commercial capabilities when making content decisions. These decisions will be made following evaluation of cost (procurement, development and sustainment), schedule, integration complexity and requirement satisfaction for multiple commercial and industry tools as well as new-development options.

Mr. LAMBORN. How do you plan to train and incentivize people to follow this prioritization and then hold them accountable, as necessary?

General RAYMOND. Training starts with an understanding of the threat environment. Adopting and improving commercial solutions that meet government requirements is one of the simplest ways to acquire capabilities on a timeline to outpace threats. Personnel are trained to look at all commercially available technologies and existing capabilities when building acquisition strategies to meet requirements, developing technical solutions, and issuing Requests for Information. Senior leaders provide oversight and hold organizations/personnel accountable for providing space capabilities to the nation.

Mr. LAMBORN. I understand that there have been delays in the Air Force's Pathfinder 2 initiative due to property management and appropriations law constraints related to the use of transponders and satellite bandwidth. To what extent could these delays be avoided with more flexible spending authority? What is the timeline for completion of Pathfinder 2 and Pathfinder 3?

General BUCK. As Commander JFCC SPACE, I respectfully defer to Air Force Space Command and General Raymond as to the specifics of Pathfinder acquisition. Commercial SATCOM is vital to the joint fight and we will continue to work closely with Air Force Space Command.

Mr. LAMBORN. As you know, satellite communications have never been more vital to the security of our nation or come under such assault. To address the cyber threats to our satellite communications and accelerate adoption of built-in cyber defenses, the Department developed information assurance requirements for commercial providers. To what extent does the Department use information assurance criteria in its evaluation and acquisition of COMSATCOM? What is the process for evaluating commercial suppliers' information assurance capabilities?

General BUCK. As Commander JFCC SPACE, I respectfully defer to Air Force Space Command and the Defense Information Systems Agency (DISA) as to the criteria related to COMSATCOM acquisitions. It is absolutely critical to ensure cyber protections are in place for space systems within the DOD space enterprise and we are confident AFSPC and DISA are the appropriate agencies to ensure appropriate criteria are applied to satellite communications acquisitions.

Mr. LAMBORN. What steps for the new EBM2 program or other related efforts (e.g., market research, acquisitions, demonstrations, evaluations, exercises, experiments, prototypes, proof of concepts, pilots, numerical validations, operations, etc.) has the USAF taken to identify commercial SSA/BMC2 software capabilities and services that can, in whole or in part, help satisfy the USAF's needs for improved SSA and BMC2?

General BUCK. As Commander JFCC SPACE, I respectfully defer to Air Force Space Command and General Raymond as to the specifics of SSA/ESBMC2 acquisitions. Based on recent requests for information, however, it does not appear that a single commercial company or commercial capability can address the full set of ESBMC2 requirements. ESBMC2 is a complex challenge to overcome; this is why we continue to work closely with AFSPC and SMC to ensure operational equities are accounted for in the requirements definition process and to guide the delivery of capabilities to address the most critical operational needs first.

Mr. LAMBORN. Have any commercial SSA/BMC2 software capabilities and services been identified that will help satisfy the USAF's needs for improved SSA and BMC2?

General BUCK. As Commander JFCC SPACE, I respectfully defer to Air Force Space Command and General Raymond as to the acquisition of commercial SSA/BMC2 software capabilities. However, my team is in lock-step with both Air Force Space Command and the Space and Missile Systems Center as they work toward an SSA/BMC2 solution that meets warfighter requirements to include incorporating commercial data through systems such as the Non-traditional Data Pre-Processor (NDPP). In addition, when the JICSpOC began in July 2015, we realized early on one set of tools for space protection was available. With the help of the 50th Space Wing, we brought commercial SSA and Battle Management Command and Control tools into the JICSpOC, and leveraged other commercial data providers to augment our SSA picture during experimentation. The lessons from experimentation have informed follow-on ESBMC2 acquisition planning.

Mr. LAMBORN. In all of its efforts, including the RCO program and consortium, what is the USAF's plan to prioritize the use of commercial SSA/BMC2 software capabilities and services to the maximum extent practicable first before then filling in any remaining operational gaps with government prototyping and redevelopment for the truly unique military requirements that don't reside in the commercial marketplace? How is this prioritization reflected in the USAF's current FY17 funding plan as well as in the proposed FY18 budget going forward through the FYDP?

General BUCK. As Commander JFCC SPACE, I respectfully defer to Air Force Space Command as to the acquisition of commercial SSA/BMC2 software capabilities and services and associated Air Force budget plans. We continue to work closely with both Air Force Space Command, Space and Missile Systems Center and the Air Force Research Lab toward an SSA/BMC2 solution that meets warfighter requirements.

Mr. LAMBORN. Given that the USAF continues to not follow this prioritization on the JMS program, under the JEON, and with the NDPP, what steps are being taken to change this and ensure AFSPC, SMC, AFRL, RCO and all other supporting organizations follow through on this prioritization?

General BUCK. As Commander JFCC SPACE, I respectfully defer to Air Force Space Command and General Raymond as priorities of AFSPC, SMC, AFRL and RCO. JFCC SPACE will continue to work closely and provide feedback on the JMS program.

Mr. LAMBORN. How do you plan to train and incentivize people to follow this prioritization and then hold them accountable, as necessary?

General BUCK. As Commander JFCC SPACE, I respectfully defer to Air Force Space Command and General Raymond as priorities and accountability of AFSPC, SMC, AFRL and RCO. JFCC SPACE will continue to work closely and provide feedback on the JMS program.

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#### QUESTIONS SUBMITTED BY MR. HUNTER

Mr. HUNTER. The FY17 NDAA requires DOD to avoid the use of LPTA source selection criteria in inappropriate circumstances that potentially deny DOD the benefits of cost and technical trade-offs in the source selection process. And yet DISA continues to use LPTA for commercial SATCOM acquisitions for critical national security missions such as the Army's Blue Force Tracking, the Navy's Commercial Broadband SATCOM program, and Air Force's Airborne Intelligence Surveillance and Reconnaissance SATCOM requirements. Each of these missions and more require mission assurance in their satellite communication yet are being awarded under LPTA procurement methods without technical discrimination of information assurance, availability, reliability, etc.

What steps are being taken to ensure mission critical warfighting services, like Commercial SATCOM, are performance based acquisitions with proper technical trade-offs rather than LPTA? What process is in place to adjudicate and report on the correct application of LPTA methodologies by DISA and other agencies?

General RAYMOND. Acquisition agencies utilize an array of methods along the best value continuum in executing competitive procurements based on the number of considerations. At one end of the best value continuum, LPTA can be appropriate where requirements are well defined, the risk of unsuccessful contract performance is minimal, agency needs can be satisfied by meeting minimum threshold levels, and where the agency does not require paying higher costs for higher performance. In addition, LPTA also takes into consideration the use of a firm fixed price type contracts. Contract type often takes into account factors such as the size of the effort, the type of effort, the complexity of the requirement, the maturity of technology, and availability of the supplies or services in the commercial market place. For AFSPC efforts, the Space and Missile Systems Center continues to examine the use of LPTA versus a broader best-value tradeoff as part of the review process associated with Acquisition Strategy Documents and Source Selection Plans. Approaches such as a Value Adjusted Total Evaluated Price are being considered as an alternative that may protect open competition while valuing more varied capabilities presented by COMSATCOM operators. Each acquisition examines a variety of items including industry capabilities, technology maturity, risk, requirements, and other acquisition related factors when developing the acquisition strategy, selecting the contract type, and determining the competitive method of evaluation to satisfy requirements. When the acquisition strategy is briefed to senior leadership, rationale for using LPTA (or not) is discussed, as appropriate.

Mr. HUNTER. The FY17 NDAA requires DOD to avoid the use of LPTA source selection criteria in inappropriate circumstances that potentially deny DOD the benefits of cost and technical trade-offs in the source selection process. And yet DISA continues to use LPTA for commercial SATCOM acquisitions for critical national security missions such as the Army's Blue Force Tracking, the Navy's Commercial Broadband SATCOM program, and Air Force's Airborne Intelligence Surveillance and Reconnaissance SATCOM requirements. Each of these missions and more require mission assurance in their satellite communication yet are being awarded

under LPTA procurement methods without technical discrimination of information assurance, availability, reliability, etc.

What steps are being taken to ensure mission critical warfighting services, like Commercial SATCOM, are performance based acquisitions with proper technical trade-offs rather than LPTA? What process is in place to adjudicate and report on the correct application of LPTA methodologies by DISA and other agencies?

General BUCK. As Commander JFCC SPACE, I respectfully defer to DISA as to the LPTA methodologies used. Commercial services are critical to joint warfighters worldwide. In fact, JFCC SPACE has found immense value in partnering with commercial entities through our Commercial Integration Cell at the Joint Space Operations Center. Such relationships are vital to ensuring a broad range of information is available for critical warfighting services.

Mr. HUNTER. The FY17 NDAA requires DOD to avoid the use of LPTA source selection criteria in inappropriate circumstances that potentially deny DOD the benefits of cost and technical trade-offs in the source selection process. And yet DISA continues to use LPTA for commercial SATCOM acquisitions for critical national security missions such as the Army's Blue Force Tracking, the Navy's Commercial Broadband SATCOM program, and Air Force's Airborne Intelligence Surveillance and Reconnaissance SATCOM requirements. Each of these missions and more require mission assurance in their satellite communication yet are being awarded under LPTA procurement methods without technical discrimination of information assurance, availability, reliability, etc.

What steps are being taken to ensure mission critical warfighting services, like Commercial SATCOM, are performance based acquisitions with proper technical trade-offs rather than LPTA? What process is in place to adjudicate and report on the correct application of LPTA methodologies by DISA and other agencies?

Ms. SAPP. The National Reconnaissance Office (NRO) uses the best value trade off process for nearly all its requirements. The best value source selection process allows the NRO to place greater emphasis on technical and other non-cost categories and select the proposals that offer the best solutions in terms of technical performance and cost. This approach encourages industry to provide innovative, high performing systems and quality services. More specifically, multiple recent NRO source selections have used evaluation criteria that clearly state that non-cost factors are either significantly more important or approximately equal to cost or price and that the Government may select other than the lowest proposed cost. To emphasize this approach, the DNRO introduced the Executable Contracts Initiative to improve acquisition outcomes and award contracts with attainable schedules and realistic prices. This initiative emphasizes investing in early acquisition planning to create tighter Statements of Work to clearly define requirements, develop incentives that clearly reflect NRO priorities, use all contracting tools available, conduct thorough market research to ensure industry has both the capacity and capability to perform, emphasize cost realism not proposed cost, and conduct overall risk assessments that evaluate past performance, capabilities, cost, and schedule. The lowest priced technically acceptable process is rarely used by the NRO and is generally reserved for acquisitions with less complex technical requirements such as commodity or commercial goods and services.

Mr. HUNTER. The FY17 NDAA requires DOD to avoid the use of LPTA source selection criteria in inappropriate circumstances that potentially deny DOD the benefits of cost and technical trade-offs in the source selection process. And yet DISA continues to use LPTA for commercial SATCOM acquisitions for critical national security missions such as the Army's Blue Force Tracking, the Navy's Commercial Broadband SATCOM program, and Air Force's Airborne Intelligence Surveillance and Reconnaissance SATCOM requirements. Each of these missions and more require mission assurance in their satellite communication yet are being awarded under LPTA procurement methods without technical discrimination of information assurance, availability, reliability, etc.

What steps are being taken to ensure mission critical warfighting services, like Commercial SATCOM, are performance based acquisitions with proper technical trade-offs rather than LPTA? What process is in place to adjudicate and report on the correct application of LPTA methodologies by DISA and other agencies?

Mr. CARDILLO. The National Geospatial-Intelligence Agency (NGA) conducts source selections in a variety of ways in accordance with the Federal Acquisition Regulation (FAR). NGA may use FAR part 15, "Contracting by Negotiations," FAR Part 12, "Acquisition of Commercial Items," or FAR part 13, "Simplified Acquisition Procedures," depending on which approach best meets the need of the Government for a given set of requirements.

Every acquisition is viewed independently. Each Contracting Officer (CO) has the fiduciary responsibility to weigh all options to determine which is in the best inter-

est of the Government. The CO presents and justifies their approach to the Contracts Review Board, chartered by the Senior Procurement Executive. The criteria for determining whether to use Lowest Price Technically Acceptable (LPTA) or best value trade-off include the importance of the need and the complexity of the requirement. NGA's Acquisition Plans, Acquisition Strategies, and Negotiation Memorandums capture the CO's decision and why LPTA or best value trade-off was chosen.

Although NGA periodically sends funds to the Defense Information Systems Agency via Military Interdepartmental Purchase Requests for various efforts, including Comsat/Transport Services, NGA does not provide direction or guidance and has no insight regarding how DISA manages its acquisition activities.

Mr. HUNTER. The FY17 NDAA requires DOD to avoid the use of LPTA source selection criteria in inappropriate circumstances that potentially deny DOD the benefits of cost and technical trade-offs in the source selection process. And yet DISA continues to use LPTA for commercial SATCOM acquisitions for critical national security missions such as the Army's Blue Force Tracking, the Navy's Commercial Broadband SATCOM program, and Air Force's Airborne Intelligence Surveillance and Reconnaissance SATCOM requirements. Each of these missions and more require mission assurance in their satellite communication yet are being awarded under LPTA procurement methods without technical discrimination of information assurance, availability, reliability, etc.

What steps are being taken to ensure mission critical warfighting services, like Commercial SATCOM, are performance based acquisitions with proper technical trade-offs rather than LPTA? What process is in place to adjudicate and report on the correct application of LPTA methodologies by DISA and other agencies?

Mr. HILL. DOD is complying with the referenced requirements of section 813 of the National Defense Authorization Act for Fiscal Year 2017 (Public Law 114-328) (NDAA for FY 2017). The evaluation criteria for each commercial satellite communications (COMSATCOM) lease are considered independently based on a review of the requirement and consultation with the customer organization. The use of lowest price technically acceptable (LPTA) is determined to be appropriate when: the minimum requirements are clearly definable; the Government would realize minimal to no value from a proposal exceeding the minimum requirements; varying technical approaches would require little to no subjective judgment for acceptability; proposals would not result in the identification of factors that could provide value or benefit; and the price reflects full life-cycle costs. The LPTA source selection process is appropriate when best value is expected to result from selection of the technically acceptable proposal with the lowest evaluated price. (FAR 15.101-2(a)). Thus, in certain cases, this approach can yield great competitive value for the Government in meeting its well-defined requirements. Approximately 85 percent of the current COMSATCOM contracts procured through the Defense Information Systems Agency (DISA) are for transponded capacity, or pools of bandwidth supporting diverse missions over specific regions. Transponded capacity requirements are well-defined with established service-level agreements providing high availability and reliability standards that do not allow for value from a proposal exceeding the minimum requirements. The Government has been very well served by the highly competitive use of LPTA in appropriate cases. For example, in the specific cases of Blue Force Tracking and the Commercial Broadband Satellite Program (CBSP) Satellite Services Contract (CSSC), the basic requirement was for large amounts of satellite capacity, teleport services, and terrestrial backhaul. The specific performance standards, such as coverage and availability, continued to be well-defined as stated above. The competitive award of Blue Force Tracker in 2013 resulted in an estimated life cycle cost (LCC) savings of approximately \$169.2M when compared to the predecessor contract. Similarly, the competitive award of the CSSC in 2016 resulted in an estimated LCC savings of approximately \$139.5M. Performance on both of these contracts remains acceptable.

#### QUESTIONS SUBMITTED BY MR. BRIDENSTINE

Mr. BRIDENSTINE. Will JMS Inc 2 Full Deployment satisfy growing processing requirements associated with increased observations from new SSA sensors like Space Fence, ORS-5, etc, prior to delivery of ESBMC2?

General RAYMOND. Yes, JMS Inc 2 will be able to support 3 million observations a day, 50+ million observations accessible in the database and a catalog of 100,000 objects as required in the JMS Capabilities Development Document. These requirements were set for JMS to ensure it can handle the catalog capacity that is expected in the future.

Mr. BRIDENSTINE. Do you anticipate that JMS Inc2 Full Deployment will fulfill all SSA processing requirements from implementation until delivery of ESBMC2?

If not, what is the USAF's plan to mitigate this gap? Will COTS capabilities with mature TRLs be considered for timely and cost-effective implementation?

General RAYMOND. No, JMS Inc 2 will replace legacy space situational awareness (SSA) capabilities and also includes SSA enhancements to include a TS/SCI catalog, increased system throughput to support Space Fence and other future sensors, and automation of many legacy capabilities. Other SSA enhancements such as an Electro-magnetic Spectrum Common Operating Picture and a Special Access Program enclave will be completed by ESBMC2. To facilitate the transition from JMS Inc 2 to ESBMC2, AFSPC initiated the Global Sensor Watch (GSW) program. GSW integrates the Space Surveillance Network by leveraging Element Sets produced by legacy C2 at Dahlgren, VA (current) and JMS Inc 2 in the future (once JMS is operationally accepted). The GSW architecture was built within the JMS AFRL ARCADE development environment and will directly connect to JMS and the BMC2 Joint Emergent Operational Need (JEON) Spiral Capability sets. Collaboration has already begun between the SMC and the Air Force Rapid Capabilities Office (AFRCO) to ensure that these evolving SSA processing capabilities will continue to align with the future ESBMC2 architecture. Yes, the USAF will consider COTS capabilities with mature Technology Readiness Levels (TRLs) for timely and cost-effective implementation. The Air Force will balance urgent operational needs with life-cycle costs, since JMS Increment 2 has shown that COTS capabilities may require significant time and investment in order to become an integrated piece of a comprehensive solution. The plan to mitigate the gap between the JMS Increment 2 Full Deployment Decision and full delivery of ESBMC2 includes JEON ST-0006 and the AFRCO Operational Prototype.

Mr. BRIDENSTINE. The FY17 Defense Appropriations Bill appropriated \$5M for the Commercial Weather Data Pilot Program. What is the status of the program? What is the anticipated overall timeline and budget for the pilot?

General RAYMOND. The Air Force has appointed the Air Force Life Cycle Management Center as the Systems Programs Office to oversee the pilot program. The program is scheduled to initiate in July 2017, pending initial distribution of FY17 appropriations. Current plans are to leverage available space weather data sources to assess the viability of commercial satellite weather data in supporting DOD operations. The Air Force intends to complete industry solicitations by this summer and evaluate data quality and impacts to existing models used to characterize the natural space environment. This effort is expected to be completed by October 2018, using the FY17 funds. If funding were to be available in FY18 and beyond, additional evaluations could be initiated on commercial data sources from airborne and ground based sensors and their potential to improve global battlespace awareness and numerical weather prediction capabilities.

Mr. BRIDENSTINE. How does your recent Space Flag exercise enhance our space warfighter capability?

General RAYMOND. April 2017, we conducted a proof of concept exercise, Space Flag 17-1, with involvement from the 50th Space Wing, NSDC, JSpOC and Air Force Warfare Center. As a first event and proof of concept, we had modest goals for the exercise. However, the event was a huge success. We were able to exercise multiple crews from one of our operational space wings in a realistic threat scenario. They were able to develop new tactics, work on intelligence integration but most importantly, focus on fighting our systems in realistic threat environment. Our intent moving forward is to build on this success and have Space Flag events tied to each Space Mission Force training cycle.

Mr. BRIDENSTINE. The ability to provide responsive launch is a crucial aspect of space resilience. What efforts are being undertaken to ensure the nation has a range of flexible and responsive launch options that include expendable, partially reusable, and completely reusable assets? What funding levels are necessary to get a responsive launch capability demonstration program initiated?

General RAYMOND. Flexibility and responsiveness are key parts of the Space Warfighting Construct. The foundation of our current architecture is fully expendable launch systems. Looking forward, the Space and Missile Systems Center has been actively engaged in continuing to expand the launch options for National Security Space. It is pursuing a number of initiatives including: new requirements for increased capabilities; multi-manifest (rideshare) opportunities in partnership with NASA; research and development of reusable launch systems; beginning to evaluate how to certify previously flown hardware and systems for future National Security Space launches; moving towards an Autonomous Flight Safety System; and leveraging allied capabilities in a contingency role for National Security Space launches. SMC is also partnering with NASA on a demonstration called Orbit Transfer Ele-

ment to investigate a concept of operations to leverage lower cost launch capabilities by launching spacecraft to a Low-Earth Orbit and using other more efficient and cost effective technologies to move the spacecraft into a Geosynchronous Earth Orbit. We identified a Launch-on-Demand (LOD) system as a part of the Space Enterprise Vision architecture. However, a defined requirement for a demonstration program and associated funding cannot be established until an achievable roadmap to a future end-state and key enabling technologies are developed. The Small Payload Rideshare Association (SPRSA) held a workshop with SMC and the NRO to discuss rapid launch and LOD initiatives in April 2017. The workshop included industry members Virgin Orbit, Rocket Lab, Orbital ATK, and X-Bow (pronounced Cross-Bow) Launch Systems. The goal of this workshop was to gain awareness of industry capabilities and timelines required to execute small Launch-on-Demand missions. The Air Force Launch Enterprise Directorate at SMC will independently meet with each company to discuss costs and planning required to meet DOD responsive/rapid launch concepts and desired capabilities. Additionally, Congress increased the Space Test Program's budget this year by \$15 million to explore procuring a Venture Class Launch service. The SMC team will work with the current Venture Class providers to demonstrate a rapid commercial launch of DOD research and development payloads to low earth orbit by the first quarter of FY19. This demonstration will provide insight into cost and capabilities available for future Launch-on-Demand missions.

Mr. BRIDENSTINE. As the SATCOM Pathfinders continue to progress are there any contracting obstacles that can inhibit success? For example, would a shift to multi-year contract authority (or another) help? If so, how?

General RAYMOND. Currently, there are no contracting obstacles that inhibit Pathfinder success. Use of multi-year contract authority should not be a consideration as this time. It may be a consideration in the future if decisions are made to acquire all transponder communication capacity on several commercial satellites as a block type buy to meet warfighter protected tactical communication needs.

Mr. BRIDENSTINE. What benefits would a NATO ally launch back-up provide? Are efforts underway to explore such options? What is the necessary funding to study the feasibility of back-up launch capability with NATO allies?

General RAYMOND. Having a NATO ally launch capability could potentially provide access to space for critical national security space assets in the event of catastrophic incidents occurring within the United States that affect U.S. launch capability. Beginning in 2013, the Space and Missile Systems Center conducted an initial study into the possible use of allied launch systems by means of publicly available information. In the past 2 years, after deciding on Arianespace as a candidate ally launch system, SMC pursued an exchange of technical information with Arianespace in order to perform a study on the feasibility of their ability to provide a potential backup launch capability. The study is nearly complete and its findings are awaiting Air Force review.

Mr. BRIDENSTINE. Will JMS Inc 2 Full Deployment satisfy growing processing requirements associated with increased observations from new SSA sensors like Space Fence, ORS-5, etc, prior to delivery of ESBMC2?

General BUCK. We look forward to JMS increment 2 reaching full operational capability, especially as new sensors come on-line. JMS Inc 2 is critical to incorporating data from these new sensors. As an example, we expect the Space Fence to provide a ten-fold increase in capabilities—moving from cataloging 23,000 object to over 100,000 objects—and a fully-operational JMS Inc 2 will be absolutely key in leveraging these new capabilities.

Mr. BRIDENSTINE. Do you anticipate that JMS Inc2 Full Deployment will fulfill all SSA processing requirements from implementation until delivery of ESBMC2?

If not, what is the USAF's plan to mitigate this gap? Will COTS capabilities with mature TRLs be considered for timely and cost-effective implementation?

General BUCK. JMS Inc 2 replaces our legacy space situational awareness (SSA) capabilities, some of which have been operational since the early 1990s, while also improving system throughput and automation. This is especially important as we look toward the IOC in early 2019 of the Space Fence and the projected increase in capability. ESBMC2 will expand upon JMS Inc 2 to include higher security levels and an enhanced common operating picture. The Air Force will certainly consider commercial capabilities to mitigate any gaps between the full delivery of JMS Inc 2 and future ESBMC2 capabilities. We would expect to see similar possible solutions to that of the non-governmental SSA contract we are currently using to support the NSDC experimentation to address possible gaps between JMS and ESBMC2.

Mr. BRIDENSTINE. How does your recent Space Flag exercise enhance our space warfighter capability?

General BUCK. Space Flag is a critical tool for providing advanced training under our Space Mission Force construct. Unlike a “Red Flag” multi-domain exercise, where space forces are typically employed in support of a larger air campaign, Space Flag allows space crews to learn how to fight their own weapon systems. Space Flag give crews specific, realistic, threat-based scenarios to “fight through.” Focusing on fighting their specific weapon systems helps operators move from an engineering, or service-provider mindset to a warfighting mindset. We intend to build and mature Space Flag events within the Space Mission Force construct.

Mr. BRIDENSTINE. The ability to provide responsive launch is a crucial aspect of space resilience. What efforts are being undertaken to ensure the nation has a range of flexible and responsive launch options that include expendable, partially reusable, and completely reusable assets? What funding levels are necessary to get a responsive launch capability demonstration program initiated?

General BUCK. The ability to provide responsive launch is a crucial aspect of space resilience. What efforts are being undertaken to ensure the nation has a range of flexible and responsive launch options that include expendable, partially reusable, and completely reusable assets? What funding levels are necessary to get a responsive launch capability demonstration program initiated? Answer: As Commander JFCC SPACE, I would respectfully defer to Air Force Space Command and General Raymond on the acquisition and funding of space launch systems.

Mr. BRIDENSTINE. The ability to provide responsive launch is a crucial aspect of space resilience. What efforts are being undertaken to ensure the nation has a range of flexible and responsive launch options that include expendable, partially reusable, and completely reusable assets? What funding levels are necessary to get a responsive launch capability demonstration program initiated?

Mr. HILL. In light of the enduring and rapidly evolving threats to our space capabilities, we need to continue to improve operational responsiveness and resiliency across all space mission areas, including launch, to provide overall space mission assurance. DOD acquires space launch services from U.S. commercial providers, which are making many innovative investments to reduce costs and diversify options, including partially reusable capabilities and more responsive systems. DOD’s Fiscal Year 2018 investments focus on maintaining assured access to space by investing in the U.S. commercial launch base, and funding Research and Development, such as the Defense Advanced Research Projects Agency’s (DARPA) Experimental Spaceplane 1, to mature and transition key technologies and operational processes for less expensive, responsive next-generation launch systems.

Mr. BRIDENSTINE. What benefits would a NATO ally launch back-up provide? Are efforts underway to explore such options? What is the necessary funding to study the feasibility of back-up launch capability with NATO allies?

Mr. HILL. The Department of Defense is required by statute and policy to launch National Security Space (NSS) payloads on U.S.-manufactured launch vehicles, unless the Secretary of the Air Force determines that there is a national security issue that precludes the use of U.S. commercial providers. Pursuant to the NDAA for FY 2017, Section 1604, DOD is developing a plan to use allied launch vehicles to meet the requirements for achieving the policy relating to assured access to space set forth in section 2273 of title 10, U.S. Code, in the event that such requirements cannot be met, for a limited period, using only launch vehicles of the United States. Work on this plan is ongoing, is funded, and is on schedule for submission to Congress in September 2017.