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COMMITTEE ON
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UNITED STATES SENATE

HEARING TO RECEIVE TESTIMONY ON THE UNITED STATES SPACE FORCE PROGRAMS IN REVIEW OF THE DEFENSE AUTHORIZATION REQUEST FOR FISCAL YEAR 2023 AND THE FUTURE YEARS DEFENSE PROGRAM

Wednesday, May 11, 2022

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U.S. Senate
Subcommittee on Strategic Forces
Committee on Armed Services
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The subcommittee met, pursuant to notice, at 4:37 p.m. in Room SR-232A, Russell Senate Office Building, Hon. Angus King, chairman of the subcommittee, presiding.

Committee members present: Senators King [presiding], Kelly, Fischer, Cotton, Rounds, Cramer, and Tuberville.

OPENING STATEMENT OF HON. ANGUS KING, U.S. SENATOR FROM MAINE

Senator King: I call this hearing of the Strategic Forces Subcommittee of the Senate Committee on Armed Services to order.

And I want to thank our witnesses for joining us today before this subcommittee and thank you for your service.

The purpose of today's hearing is to examine the fiscal year 2023 budget of the Space Force, a separate Title 10 service, which was recently authorized in the fiscal year 2020 National Defense Authorization Act. For fiscal year 2023, the Space Force budget is $24.5 billion, a $7.1 billion or 40 percent increase over fiscal year 2022. Of the $7.1 billion, however, $3 billion is for interservice transfers, as the Space Force assumes satellites and people from the Army and Navy, and the remaining $4.1 billion is for programmatic growth, still a 20 percent increase over fiscal year 2022.

I will be looking to hear what is and transferred into the Space Force, especially with the transfer of uniformed Army and Navy personnel.

The administration has submitted a proposal for a new personnel system that would treat the Space Force guardians as either full- or part-time components. The reserves would fall into the part-time component, and I want to know more

about this, given competing proposals for a Space National Guard.

Finally, since the Space Force is a Title 10 service, its purpose is to train and equip guardians to defend our assets in space, which is now a warfighting domain, given the action of Russia and China against our satellites. I want to know how our policy is developing to defend our space assets and, if necessary, ensure a near-peer adversary space system cannot be used to help a system attack on our forces on the ground or at sea during a conflict.

Again, let me thank our witnesses for agreeing to appear today, and after opening statements, we will have a 5-minute round of questions to the witnesses.

Senator Fischer?

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

Senator Fischer: Thank you, Senator King.

I join you in welcoming our witnesses. Thank you all for being here with us today and for the work that you do on behalf of this nation.

Dr. Plumb, it is good to see you again. I understand you will be testifying before this panel again next week. Three times in a row, that has to be some kind of record. We appreciate your service, sir, and we look forward to hearing from you and the other witnesses today about the continued evolution of the Department's national security space enterprise.

It has been 2 and a half years since the founding of the Space Force. We welcome the panel's views on what progress has been made, particularly toward developing an acquisition system that delivers capabilities on a timeline that is responsive to the needs of our warfighters and paces the actions of our adversaries. Thank you.

Thank you, Mr. Chairman.

Senator King: Thank you.

Our witnesses today are Mr. Frank Calvelli, Assistant Secretary of the Air Force for Acquisition, Technology, and Logistics; Dr. John Plumb, welcome back, Assistant Secretary of Defense for Space Policy; and General David D. Thompson,

Vice Chief of Space Operations, United States Space Force.

So, Mr. Frank Calvelli?

STATEMENT OF FRANK CALVELLI, ASSISTANT SECRETARY OF THE AIR FORCE FOR SPACE ACQUISITION AND INTEGRATION

Mr. Calvelli: Chairman King, Ranking Member Fischer, and distinguished members of the subcommittee, it is an honor to appear before you to discuss the future of Space Acquisition. Thank you for asking me to testify. I am excited to join the Department and for this important work to come as we optimize Space Acquisition.

As you know, we must do more, and quickly, to accelerate and improve Space Acquisition. Our adversaries are catching up, or in some cases, exceeding our capabilities. Strong partnerships between the Department, Congress, and the commercial industry are critical to outpace China and other adversaries.

As I step into this new role, I would like to share with you my initial goals and priorities. These include: one, driving speed into our acquisitions in order to deliver new capabilities faster, to outpace our adversaries, and maintain the technological advantage we get as a nation from space; two, making our space architectures are resilient so that it can be counted on during times of crisis and conflict; three, integrating our space architecture with other warfighting domains to give our warfighters a strategic edge; four, driving program management discipline across our acquisitions in order to ensure that we deliver

new capabilities on schedule, on cost, and meeting requirements; and five, ensuring that our space and ground systems come together as a system and that our ground systems are more readily available before launch to take advantage of the new capabilities that we just put into space.

I look forward to working with you over the coming months to continue the strong partnership between the Department and the Congress to optimize and strengthen Space Acquisition processes and outcomes. I look forward to your questions. Thank you.

[The statement of Mr. Calvelli follows:]

Senator King: Dr. Plumb?

STATEMENT OF HONORABLE JOHN F. PLUMB, ASSISTANT SECRETARY OF DEFENSE FOR SPACE POLICY

Mr. Plumb: Thank you, Chairman King, Ranking Member Fischer, members of the subcommittee.

I appreciate the opportunity to testify today and get my frequent-flyer miles.

As the first-ever Assistant Secretary of Defense for Space Policy, I am committed to continuing DOD'S close partnership with Congress on advancing national security space interests. Space plays a critical role in American security, prosperity, and way of life. It enables and supports the entire Joint Force. It helps protect servicemembers in harm's way and it enables them to execute their mission and defend the nation.

Space provides indication and warning of emerging threats and attacks. It delivers the GPS signals supporting rapid and precise global power projection. It generates intelligence to allow national decision-makers to anticipate risks and de-escalate crisis, and it enables those same decision-makers to command-and-control forces globally.

In the tremendous growth of commercial space, largely due to U.S. business innovation, it is fueling an increasing important part of the U.S. economy. The growth of the U.S. Space Industrial Base affords DOD new opportunities to leverage commercial advancements to support national

security.

And space has, once again, captured the imagination of a new generation of Americans. This will inspire more students to pursue careers in the STEM disciplines and that will pay dividends to our national economy and national security in the future.

Looking at the threat environment, China and Russia both seek to increase their military use of space and to exploit the perceived U.S. overreliance on space-based systems.

China remains our pacing challenge, as Secretary Austin has said. They are developing and fielding a wartime space architecture. China has dramatically increased their quantity and quality of space and counterspace systems, increasing ground- and space-based antisatellite weapons to target U.S. and allied satellites.

Russia maintains a large network of reconnaissance, communication, and navigation satellites, and they are also developing, testing, and fielding counterspace weapons, including ground-based and on-orbit capabilities to target U.S. and allied satellites. These threats require the U.S. to consider new approaches to ensuring our use of space, including developing more proliferated and, therefore, more resilient constellations.

To that end, the President's fiscal year 2023 budget

request seeks $27.6 billion for DOD space capabilities, including $4.7 billion to fund the transition to a new resilient missile-warning and missile-track architecture; $1.8 billion to procure two GPS III follow-on satellites and to continue testing and integration of military GPS-user equipment; $1.6 billion for secure, survivable, and jam-resistant SATCOM; and $1.6 billion to procure six National Security Space Launch vehicles.

In November, Russia conducted an irresponsible, destructive test of a direct-ascent ASAT missile, creating more than 1,500 pieces of trackable debris, hundreds of thousands of smaller pieces that threaten safe space operations in low-earth orbit.

In contrast, the Department is committed to promoting norms of responsible behavior in space to ensure the space domain remains secure, stable, and accessible. The Deputy Secretary of Defense stated in December at the National Space Council meeting, the Department would like to see all nations agree to refrain from antisatellite weapons testing that create debris.

And at Vandenberg last month, Vice President Harris announced a U.S. commitment that the U.S. will not conduct destructive, direct-ascent ASAT missile testing. These types of tests jeopardize the long-term sustainability and safety of space for all. This includes human spaceflight

programs and all commercial satellite operators. Ending destructive, direct-ascent ASAT missile tests is, therefore, in our national security interests and in our national economic interest. The U.S. has demonstrated a leadership with this commitment and encourages all nations to support responsible space behaviors.

So, in conclusion, the threats facing the U.S. in space, and from space, continue to grow in both, quantity and quality. Countering those threats requires that we continue this longstanding bipartisan cooperation between DOD and the Congress. I am committed to sustaining those efforts and I am honored to work with this Committee to do so.

Thank you, and I look forward to your questions.

[The statement of Mr. Plumb follows:]

Senator King: General Thompson?

STATEMENT OF GENERAL DAVID D. THOMPSON, USSF, VICE CHIEF OF SPACE OPERATIONS

General Thompson: Chairman King, Ranking Member Fischer, and distinguished members of the subcommittee, thank you for the opportunity to testify today.

It is an honor to appear before you on behalf of the Secretary of the Air Force, the Honorable Frank Kendall, the Chief of Space Operations, General Jay Raymond, and the 14,000 guardians around the world executing our space missions today.

U.S. military success and great power competition depends on access to and freedom to operate in space, while denying the same to our adversaries. In 2019, Congress established the Space Force to organize, train, equip, and present forces to deter hostile action and protect U.S. interests in space and to secure the domain for stable, peaceful use.

Space capabilities are a cornerstone of integrated deterrence, not just in space, but in every domain and those space capabilities that we operate underpin every aspect of our national security. At the same time, our space systems and use of the domain remain under threat by competitor nations.

China remains our pacing challenge. In 2021, the PRC continued to accelerate the integration of space

capabilities into its military operations, especially space-based surveillance, intelligence, and reconnaissance, which puts the soldiers, sailors, airmen, and marines, we protect and support at great risk. Additionally, Russia's overarching strategy remains to challenge the U.S. in space; that is unchanged for decades. It is continuing to improve its military space capabilities as well. Both nations are also developing and deploying an array of kinetic and non-kinetic counterspace weapons that threaten U.S. systems in every orbital regime, on the ground, and in cyberspace.

In response to these challenges, and in keeping with the reasons the Space Force was established, we continue to make substantial progress in the design, development, and fielding of space capabilities that maintain our freedom to operate in space. We advance recruiting, training, and educating the workforce that is demanded to operate in such a highly technical domain, and in putting in place the intelligence, analytic, and test foundations that ensure success of our forces in future conflict.

The President's fiscal year 2023 budget request for the Space Force does this in several ways. As examples, it initiates the first major transformation to a resilient force structure with a proliferated missile-warning, missile-tracking architecture, which is also capable of tracking hypersonic and maneuvering vehicles. It enhances

our awareness of all activities in space and the ability to command and control forces in this increasingly dynamic domain. It begins the build-out of an operational test and training infrastructure that will generate the military readiness appropriate to the challenges we face, and it allows us to assume full authority for the preparation, training, and management of the 14,000 guardians, who are Space Force's greatest asset and its primary instrument.

I look forward to discussing these and many other aspects of our request in more detail with you in today's hearing and as we partner in the coming months. Your support and enactment of the fiscal year 2023 defense authorization bill will enable the Space Force to remain the world's leader in space and to continue to preserve freedom of action for the nation.

Thank you for your continued advocacy and support. We are eager to work with your committee to build a strategy and make the investments needed to secure our nation's vital interests.

[The statement of General Thompson follows:]

Senator King: Thank you.

The first point I want to make is that we are in the process now of putting together the National Defense Authorization Act for this year, literally in a matter of -- the paperwork is moving, so we are talking about in a matter of weeks.

To the extent any of you, or the Secretary, has, or the Commanding General have suggestions or needs or thoughts about authorities or modifications to current statute, as it, as you have grown into this new force, please let us know as soon as possible so that we might consider those as amendments or as proposals in this year's National Defense Act. So, I hope you will consider that an open invitation. The other way to put it is: Don't complain next summer when you didn't get what you want if you don't tell us what you need.

Dr. Plumb, Section 1602 of the 2022 Act requires the Secretary of Defense to designate the Chief of Space Operations as the force design architect for the space systems by March of this year, 2022. This is important. We give the same designation to the Chief of Naval Operations for the fleet at sea and the Chief of the Air Force for planes in the air. During our Air Force posture hearing, Senator Reed asked the Chief of Space Operations whether this designation had occurred, and he said it was still

residing in the Office of Secretary of Defense Space Policy.

Why has this not occurred and when will it occur?

Mr. Plumb: Thank you, Senator.

I have spoken with General Raymond about that, and I have spoken with your staff about this. So, I was really alerted to this just last week. I immediately took it to my office, so my office is now responsible for it. I have initiated conversations with OGC, Office of General Counsel, on getting this right. I will get that done. It is a little bit new because it has all space in it, but we will get that designation done.

I will point out that, I think functionally speaking, and General Thompson may want to weigh in, but that functionally speaking, I believe the CSO is the Force's architect at this point, but that is not the same as formalizing it as you have asked. So, I will do that. It will take a little bit of time to get it through the building.

Senator King: Well, I hope a little bit of time is measured in weeks and not months.

Mr. Plumb: Yes, sir.

Senator King: Thank you.

This is a somewhat difficult situation because we are talking about some things that are public and a lot of things that aren't and we have to be careful in our

discussion. But as your testimony indicates, we know that both, China and Russia: (A), are establishing a major presence in space; (B), are establishing a capability to hold our satellites and our space assets at risk.

Insofar as you can testify in an open session, please outline our strategy, if you will, for protecting our assets and dealing with what is now a highly contested domain, which wasn't the case until pretty recently.

General?

General Thompson: General unsecured creditor, I will outline that, I will say, in three primary points today. The first element of the strategy is to fully and deeply understand all of the activities in the domain: what objects are out there; the things that they do; their capabilities; whether or not they pose a threat to us, our capabilities and our assets; the capabilities, techniques, tactics, doctrine that might be used in their employment; and to be able to ensure that we have indications and warnings should an attack be coming. And a lot of the investment in our budget and the work we have been doing to date creates the space domain awareness infrastructure and architecture that we need to do that.

The second thing is, many of the space systems that are on orbit today and will be for years to come, were not designed to operate in a domain like this and under threat;

however, there are things that we can and are doing to them to increase their ability to be defended and to contribute to their own defense, things like: ensuring that additional fuel remains onboard in case we need to maneuver; looking at ways to make them more difficult targets to track and, ultimately, to attack; and let's just say in this setting, other systems, other capabilities and other tactics that will make them more difficult to attack and destroy, should an adversary attempt to do so.

And the third major component of our strategy is to create those resilient architectures going forward that are much harder, that are survivable by design and less vulnerable in terms of protection. And the primary mechanism by which we do that, and we intend to do that, is rather than architectures today that consist of a relatively small number of very capable, very sophisticated satellites, building architectures with larger numbers of less capable, less expensive satellites, that in aggregate, give us the same capability. And, in fact, in this budget, our request for the missile-warning, missile-tracking architecture that we have proposed is the first major step for the architectures in that regard.

So, in this setting, those are the three major points of making us more defendable and more resilient in space.

Senator King: Thank you. Excellent.

Senator Fischer?

Senator Fischer: Thank you, Mr. Chairman.

General Thompson, I appreciate the Space Force's effort to pivot towards proliferated satellite architectures. The resilient missile-warning, missile-tracking program that I discussed with General Raymond at the full committee hearing last week, is but one example of that.

I agree with the conceptional advantages distributed architectures provide, but how ready is the industrial base to meet production needs associated with those much larger constellations?

General Thompson: Madam Senator, I would say that it is probably as ready as it has been in the last several decades and for several reasons. One is, we maintain some sort of capability in terms of the production of our current satellites and some of the investments in technology and prototyping, but a great portion of the industrial base is expanding because of commercial investment.

And while there are some specific aspects of military and national security space systems that don't lend themselves to commercial investment, a vast majority of the operating techniques, the subsystems used would apply both, to commercial investment and to military national security investment, as well. So, while there are some very specific niche capabilities that we have pursued and we have

maintained with competition in various aspects, and I think the investment we are seeing in commercial space has served all of us well in creating a more robust and more capable industrial base to address our space needs.

Senator Fischer: Do you see limitations or bottlenecks on certain things like refrigeration units, for example?

General Thompson: I would say there are a few very boutique capabilities for which we probably have a few bottlenecks. Some of the sophisticated sensors that we use, the sensor elements and those aspects of them, we do, but generally speaking, when you think about the subsystems onboard a spacecraft, whether it is power subsystems, propulsion subsystems, attitude control, generally speaking, there are not bottlenecks in that regard, but there are for some of the very specialized capabilities and specialized technologies, there are a few.

Senator Fischer: You don't find that a limitation?

General Thompson: I would say it is, but I cannot point specifically today to any space system whose development is being held up due to the lack of the readiness of a capability or a provider for those capabilities.

Senator Fischer: When the Space Force is looking at architecture or design, is there a process through which it takes industrial base limitations into account so that we

don't produce plans are a technically sound, but not feasible?

General Thompson: Yes, ma'am, there is.

And, really, what happens is, and it is part of a longstanding process, but part of our new process, one of the new processes that we created in our Space Warfighting Analysis Center was to bring in industry early and any Force-design activity that we are performing, providing them with our requirements, our design concepts, the results of our analysis as to how, in fact, we intend to accomplish missions, provide them with all of that data and ask them to provide input directly, or come back later after the fact. That is one point in time in which we can have the conversation about whether the technology is there.

But the second point is when we then take those designs and hand them over to Mr. Calvelli and the Acquisition team, that is where they truly begin the extensive review of all the expected technologies, and as part of the system acquisition process, determine whether the technology is available, whether it is ready, whether there is risk-reduction and prototyping work that needs to be required, and assess the risks and effort required to either, deliver the system or come back and say, unfortunately, the technology is probably too risky to pursue at that point.

Senator Fischer: Did you have anything, Mr. Secretary, you wanted to add to that?

Mr. Calvelli: No, I think General Thompson nailed it really well.

And you are right, ma'am, you don't want to start down an acquisition that you can't execute because of the supply chain or technology issues, so you have to take a really close look up front and make sure whatever you are going to decide to put out in that request proposal and then put under contract is actually something you can achieve.

Senator Fischer: You know, we have to meet the needs of combatant commanders at STRATCOM, especially, and there has been, I would say, some questions raised on the ability to meet those needs and what is needed as a resource to do that. Thank you.

Senator King: Senator Cotton?

Senator Cotton: Thank you, Gentlemen.

Mr. Secretary, from where I sit on this committee and the Intelligence Committee, it seems like the NRO has been slightly more successful in delivering space capabilities in a timely and efficient fashion.

Can you talk to us a little bit about your experiences there and what your plans are to help replicate that success in the Department.

Mr. Calvelli: Yes, thank you, Senator.

The NRO has a culture of programmatic discipline. It is inherent in its DNA. We expect our program managers to understand, technically, their programs, to understand their contracts, and to deliver on cost, on schedule, and meeting the requirements.

From my position where I was at as the deputy there and working with the director, we also sort of oversaw and made sure that culture continued, and we managed our programs. We managed our program element officers and our program managers to deliver. I mean, so that became just part of the culture over the last decade or so that, you know, it is really important that you hit your plan.

The other thing is, you know, we really learned some things about making sure that when we put proposals out there that we really get realistic cost proposals back and realistic schedules, especially in a competitive environment. That is really key to ensure that you have that, so you know that whatever they are delivering to you is actually going to be executable. And when you review proposals to make sure that you put in place the right contract strategy, the right contract incentives that are going to incentivize success.

Senator Cotton: Okay. General Thompson, what do you think about that?

General Thompson: Mr. Senator, I agree. I have got

some experience, not on the acquisition side, but in the operational side of the NRO, and it really is that aspect of discipline in the execution of a program from start to finish and the tendency not to decide that each successive article needs to improve in capability, but rather, to provide consistent and expectations up front and throughout the schedule that makes it important.

Senator Cotton: Okay. One interesting note from the war in Ukraine is that most people assess that Ukraine's communications or internet access would be cut off in the first days, really the first hours of the war. That did not happen, and it still has not happened. I think that is, in part, based on satellite-based internet.

What lessons have we learned about what we can do, should we ever face a similar conflict with Russia and China, where they are trying to deny us that?

Mr. Calvelli: Well, I think the one lesson that I have seen is that by adding and integrating commercial capabilities, that you are going to diversify your architecture and make it much more resilient, and so that has really been a great piece of the puzzle to actually watch happen how a commercial technology and commercial capability has added resiliency along the way.

General Thompson: And I would add to that that, I think what we are seeing as a result of their ability to be

prevented from using space capabilities is also a reflection of these new proliferated architectures that are very difficult to deny overall. You may be able to deny a piece of it, but you can't eliminate the capability at large.

And as we look, we are beginning a new Force design activity to look at the future of space-based communications and data relay, not only bringing in commercial capability, but absolutely, that proliferated architecture that makes a network that is very difficult to defeat in total, is another element of what I think we are learning from Ukraine.

Senator Cotton: All right. Mr. Plumb, any thoughts on that?

Mr. Plumb: Yes, Senator. I would just add, I think it is a really good example of resilience means different things for different constellations and functions. So, for ISR or for, actually, for missile-warning, missile-track, that is a proliferated set of orbits with IR sensors. But SATCOM, in particular, on your question, there is a lot of commercial capacity. There is more coming in using that as a totally different approach to get to the same end, which is resiliency. It is really important.

Senator Cotton: All right. Thank you.

General Thompson, the budget brief highlights a $36 million investment in climate initiatives. Can you tell me

a little bit more about that?

General Thompson: Yes, sir, two things. First of all, it is really a matter of understanding our base infrastructure, the facilities, the power infrastructure. Most of our space capabilities are operated from home station. They operate 24/7. They have to operate in peacetime and wartime, and most of that is focused on ensuring that the power systems and the means by which our bases operate under all conditions can be sustained, regardless of peacetime, conflict, climate conditions, and things like that. That is part of it.

The second aspect is, we do own part of the weather and meteorological mission for the Department of Defense and the nation, and part of that investment includes our space-based environmental monitoring and some of the tools and techniques that we use to do that, as well.

Senator Cotton: Okay. Thank you.

Senator King: Senator Rounds?

Senator Rounds: Thank you, Mr. Chairman.

Gentlemen, first of all, thank you for your continued service to our country.

Mr. Calvelli, massive amounts of data are sent and received through space every second. In order to maintain our technological edge, integration of artificial intelligence and quantum computing will be necessary to

process all of this data in a timely manner. What are your thoughts on how we acquire this type of capability?

And, General Thompson, to the extent that you can in this open session, can you describe and assess what our adversaries, specifically China, are doing in these areas.

Mr. Calvelli?

Mr. Calvelli: I think one of the challenges on the AI front is making sure that our data is accessible by algorithms down the road. And so, you know, we have had a lot of history of closed architectures. What you really want to do is make sure your ground systems are open, that your data is exposed through application programming interfaces, and that future algorithms, whether that be machine-learning algorithms or AI algorithms can actually access the data. I think that is going to be one of the biggest keys to getting the data accessed.

As far as quantum computing goes, you know, we are really, as a nation, I believe, in the research and development stage of that and I think that the nation needs to continue that. I honestly don't know from what sort of, the role of the services in that area. But I do believe that we need to, as a country, really spend money and foster the ability for this nation to develop quantum techniques. It is going to drive a whole road of encryption down and high-speed processing that I think we want to stay the

leader as a nation.

Senator Rounds: If I could, just to clarify, because when we talk about this, I think people kind of pull everything together on it, AI is here, and it is being integrated now; is that fair to say?

Mr. Calvelli: Yes, I agree.

Senator Rounds: Thank you.

General Thompson?

General Thompson: Senator, just a few comments in regard of Russia and China, and I will say, primarily China, but it applies to Russia, as well. I would argue that while the creativity and ingenuity and energy in our academic and commercial sector is tremendous, and in many cases, our asymmetric advantage, the Chinese, for sure, have a plan and an expectation to lead the world in AI by 2030. They have made that public. They are making great advances; in some cases, on their own, in some cases because many of their scientists and engineers study in American universities. So, they have a plan to outpace us in that regard and they are certainly capable adversaries. So, I would say this is absolutely an area of competition that we need to expect and be attentive to in the years to come.

Senator Rounds: Thank you, General.

And I just want to follow-up on that because I think the next step on this is talking about the other areas. We

have been competing against our adversaries in air, land, sea, cyberspace, and now we see them most certainly challenging us in space. Both China and Russia have conducted antisatellite operations and have weaponized space. I mean weaponized space in an attempt to deter and counter U.S. effectiveness in space.

To the level that you can in this open forum, can you describe the threats our adversaries are posing to us in space, and do you have the authorities and resources needed to be able to respond to these threats?

And the reason why I bring it up, once again, is as the Chairman of the Committee has indicated, if we need to make policy changes to respond, now is the time to get that out or we are going to end up waiting another year.

General Thompson: In terms of their capabilities, in fact, we have become much better at declassifying and communicating those capabilities in an unclassified sense. I said in my opening statement that they can threaten us kinetically and non-kinetically in every domain.

As you mentioned, the Russians conducted a destructive antisatellite missile test in November 2021. The Chinese did that in 2007. They have been rapidly fielding capabilities ever since. Both have on-orbit capabilities that attack our satellites directly. Both also have multiple ways to attack us through cyberspace, laser

dazzling and RF, and so I would say, absolutely, they can threaten us in every regime and by every means available.

Senator Rounds: What would be your response, General, to those who say that space is not or should not be thought of as a warfighting domain?

General Thompson: Senator, I would say that, first of all, Russia and China have voted, and they have already decided that it is. And our primary purpose as a Space Force is to make sure that we can deter them from making it a true domain of conflict in the direct sense, and if not, should they go to that, it is our job to ensure that we can continue to operate effectively in space regardless.

Senator Rounds: Thank you.

Thank you, Mr. Chairman.

Senator King: And now I want to call on the only person in this room who has ever been to space, Senator Kelly.

Senator Kelly: Thank you, Mr. Chairman.

And I do miss it.

Senator King: Especially around here.

[Laughter.]

Senator Kelly: I wasn't going to say that. No, but it is great to have the opportunity to serve again in a different role.

General Thompson, I have a question about Space

National Guard and this topic came up in last week's Air Force posture hearing. And I understand that currently, the National Guard's space capability is organized in 17 units, across seven states, in Guam, and is made up of nearly 1,500 airmen, or 15 percent of the Space Force.

And as General Raymond mentioned last week, the National Guard has been involved in the space mission for 25 years. When asked about the prospect of a Space National Guard last week, General Raymond indicated that there are two ways to ensure that we maintain that capability. One was to either have a separate Space National Guard and the other was to take the capabilities from the Guard and move them into one combined, active-duty and reserve component.

Now, that second option assumes that current Air National Guard members will transfer to the Space Force under a mixed, full-time, part-time active component model. This ignores the fact that many folks who joined the Air National Guard, they did so because of geographic stability that the offers the members and their families, as well as the opportunities sometimes to serve their state.

So, General Thompson, what are your thoughts on the advantages of establishing a Space National Guard, and to your knowledge, is the Department of the Air Force assuming that those nearly 1,500 guardsmen would transfer into a combined, active-duty and reserve component, if we did take

that approach?

General Thompson: Senator, you certainly characterized the current state and situation very well. The Guard has served effectively in the Air Guard beside Space Forces of, at the time, the United States Air Force for decades. We cannot do without the capability and missions that they provide today moving into the future.

And so, if, in fact, we do not create a Space National Guard, and as you stated, the administration has come out with a statement of policy to say that we do not want to create a Space Guard, we do have to do that assessment in, ultimately, planning and preparation to move those forces. We are doing an assessment right now of that. We do not make the assumption that any number of Guardmembers will make that transition; that option would certainly be presented to that if it came to that point. We are making no assumptions about whether those members would accept or desire that transfer or not. We are certainly, as part of our assessment, determining what would be required to replace those members, by Space Force members, the numbers it would take, the training time it would take, the training resources it would take, and the corresponding degradation in mission as we bring those units back up to full status.

So, there are some that think that a large number of Guardmembers may transition. There are others that don't

believe that is the case. In our current assessment, we are not making the assumption that a large number of Guardmembers would transition.

Senator Kelly: And when do you think you will have this evaluation analysis done?

General Thompson: So, it is ongoing at this time. We anticipate that it will be done in time to support the next budget request.

Senator Kelly: Okay. Thank you.

Another quick question, General, in my remaining time about space debris. My understanding is that the Space Surveillance Network is currently tracking over 25,000 objects.

So, does that mean that you have state vector on 25,000 objects and how small can you currently track something?

General Thompson: Yes, sir. The updated number is now approaching 40,000 objects --

Senator Kelly: Forty.

General Thompson: -- and that is correct. We have what we call "custody," which is a state vector that is updated routinely. And we reliably track objects down to about 10 square centimeters in radar cross-section. So, if you made a fist, the size of your fist or perhaps a tennis ball, that is the size of the object we can track reliably.

I will say even conservative estimates say there are

probably at least 10 times as many other objects that are smaller than that in space that we cannot track.

Senator Kelly: So, that 40,000 number, presumably would go up, not necessarily because there are more debris objects populating LEO, but just that you are finding more; is that accurate?

General Thompson: It could if, in fact, we had more advanced sensors that had the ability to track smaller and smaller objects.

Senator Kelly: How often do you find yourself, you know, looking for something and despite having the state vector, you know longer can find it?

General Thompson: Senator, I would say that we encounter hundreds to thousands of objects a day that we need to go back and decide what the state vector is. And that is because they are in odd orbits. They are on the edge of being large enough or small enough, and in some cases, because of their size and shape, operate unlike most of the objects in orbit, which is to say, not in a Keplerian manner, as you understand it.

Senator Kelly: All right. Well, let's work together to continue to refine this, because as these number of objects go up, I think we are going to need, you know, better capability because it just puts our assets and those of our allies at risk.

General Thompson: Yes, sir.

And referring back to the last question, this is a perfect application for AI, artificial intelligence and machine learning, as well, to help us with that problem.

Senator Kelly: All right. Thank you, General.

Senator King: Senator Tuberville?

Senator Tuberville: Thank you very much.

Just to follow-up on that, if one satellite is destroyed, how many pieces, basically, on average, would come from one average satellite?

General Thompson: Senator, it depends on method. When the Chinese destroyed their test satellite in 2007 --

Senator Tuberville: Completely destroyed, right?

General Thompson: Completely destroyed.

They created over 3,700 pieces of debris that we could track. And, again, there are large, perhaps 10 times as many smaller pieces we cannot.

The Russians --

Senator Tuberville: Which was last year, right, Russia?

General Thompson: The Russians, last year, created more than 1,500 pieces of debris of that we are currently tracking.

So, that depends on, in many cases, exactly what you are talking about, thousands of pieces of debris with a

kinetic destruction.

Senator Tuberville: So that is going to be a huge, huge problem in the future, correct, if they continue to test missiles?

General Thompson: Sir, I would say, yes, that is right. And, in fact, that is one of the reasons for the tenets for responsibility of behavior that were released by the Secretary of Defense last year, and the statement made by the administration about destructive ASAT testing.

Senator Tuberville: Now, they are there forever, right?

General Thompson: Not quite forever, but for years to decades, certainly, depending on the orbital regime.

Senator Tuberville: Our lifetime?

General Thompson: Yes, sir.

Senator Tuberville: Yeah. This is kind of for all of you, you know, very simple: What would you say is the most successful aspect of the National Security Space Launch program, what is the most successful thing that we have done?

Mr. Plumb: Thank you, Senator.

I think that the ability to do, one, make sure we have the two providers and do these things in block-buys, it seems to be driving down costs, we were just talking about this before the hearing, and it provides some stability to

those contractors. So, I think it looks like a success from where I sit.

Senator Tuberville: Is the cost going down or up as we speak?

I know in your purview --

Mr. Plumb: I feel like my acquisition colleague should answer that, if that is all right, sir?

General Thompson: Sir, I know what I would say is that over the life of the program, based on the previous approach to launch and what we pursue today in the National Security Space Launch program, we believe we have saved over $7 billion in terms of what we would have paid using the past program.

And I will tell you, based on the current growth in the commercial launch industry in recent years, the addition of that competition is helping to drive costs down and may very well drive them further down in the future.

Senator Tuberville: We couldn't make it without the commercial people, could we? Or it would be very expensive?

General Thompson: No question, it would be more expensive without commercial providers.

Mr. Calvelli: Yeah, I would add to that by saying having two distinct companies providing launch services, I think, is great for the nation; the more the merrier.

Senator Tuberville: Yeah.

General Thompson: Senator, if I may?

Senator Tuberville: Yeah. Go ahead.

General Thompson: So, the Major DT Thompson was the investigating officer on the last National Security Space Launch accident in 1999. And I will tell you, one launch at a time, for almost 100 national security launches and more missions: success. And every one of those launches is the most important factor of the National Security Space Launch program for 22 years.

Senator Tuberville: Mr. Calvelli, as a transition from the single launch procurement awards to block-buys reduced the price of space launch? Has it reduced it?

Mr. Calvelli: So, I don't know specifically on NSSL, but my understanding, in general of space, when you do things in a block, it does help you to reduce the costs, yes.

Senator Tuberville: General?

General Thompson: Yes, Senator, absolutely.

Senator Tuberville: Absolutely. As the Department considers the next launch procurement contract, what new requirements will be included to ensure the U.S. beats China and Russian efforts to impact our space capabilities?

Either one -- anybody?

General Thompson: Yes, Senator. In terms of new requirements from an operational sense, right now, the

answer is not many significantly in this specific sector. We still have the same sorts of reference missions and payload designs that we need in this phase.

Where, I will tell you the new opportunities and new requirements are in a couple of areas. The first is in smaller and responsive launch to deal with things like the potential rapid replenishment of capabilities is one area of potential growth. The second is, as we see a lot of interest and energy in on-orbit servicing and maneuver. And so, an approach that not only launches the satellites to orbit or perhaps moves them around in orbit, refuels, and replenishes them; those are a couple of areas of what I will call the space launch enterprise that are growing, specifically related to National Security Space Launch in phase 3, very similar in terms of the requirements for the next phase.

Senator Tuberville: Yeah, thank you.

I was expedited about seeing the IG report yesterday moving a little bit closer possibly to get Space Command to Redstone Arsenal and, you know, we are military friendly and look forward to that possibly happening.

Thank you, all. Thank you very much.

Senator King: Thank you for that advertisement for the State of Alabama.

[Laughter.]

Senator King: Senator Cramer?

Senator Cramer: There is nothing wrong with advocating for the hometown --

[Laughter.]

Senator Cramer: -- as long as there aren't too many of you. No, it is all good.

Thanks, you guys, for being here for your service. Thanks for this morning's briefing, as well. It was really important, and it was interesting, you know, at least the parts that I understood, and I was encouraged, so thank you.

Secretary Calvelli and General Thompson, I want to talk a little bit about one of my favorite topics under your direct command and that is, of course, the PARCS Radar Facility at Cavalier. And I did ask General Raymond and General Brown about this last week, and you might have heard that or watched it; if not, I am going to ask you the same question anyway.

I noticed that it is not funded for in the budget, the modernization. And I brought it up because I am concerned, because this year's budget documents say that this radar has a, quote, high risk and equipment failures will cause unacceptable mission downtime. And I don't want that to happen, and I don't think you want that to happen. And it is a 50-year-old radar that is doing important work. And I know there is an analog-to-digital modernization effort that

the Program Office is looking at. And General Raymond told us the Space Force would address the PARCS issue in the coming budget years.

I just want to make sure that you are aware of the precarious situation that Cavalier seems to be in, and do you agree that this important 50-year technology needs a complete overhaul, if not this year, soon, to each of you?

And if you want to speak to the PARCS Radar in general, that would be fine.

General Thompson: Yes, sir.

Senator, I will absolutely say, first of all, it does fill a critical role in our missile-warning enterprise today. Part of the assessment, and we need to sustain it for that role into the future, part of what we are looking at in that regard, as well, is as we look at advancing threats, as we look at hyperglide vehicles, as we look at fractional, orbital bombardment systems, and the ability to basically fly around the South Pole to be able to attack the United States, we are in the process of understanding what the future of missile-warning and missile-defense architecture needs to look like and the role that PARCS may play in that. We are still doing that assessment. But, certainly, in the near term, it must be sustained.

The other thing I will say, and it is to some of the discussion I had with Senator Kelly, it plays a vital role

in space surveillance today, as well, and we need to ensure that that capability remains.

Senator Cramer: All right. Thank you.

I want to spend a little time now on SDA, because I know we are at that moment here in a few months where it gets rolled in when we set up Space Force. Of course, one of the goals was, and you all are doing well at it, is streamlining acquisition, obviously, speeding up RND, all of those important things that you are here to talk about. But SDA, when we stood that up in 2021, it really, we are noting the importance of this and of developing, preserving, really, an independent culture, which I think is best for innovation.

So, now, once it gets rolled in, maybe you guys can help me understand your commitment that SDA will preserve at least some of its independence and autonomy, while it also does important work for you and the Joint Force, of course. If you have a sense of how that might be managed, that would be helpful.

Mr. Calvelli: Yeah, actually, you are thinking along the same way I am. I am excited about SDA coming onboard. I think they are doing some really neat stuff with their proliferated LEO system and Tranche 1 for their communication satellites. I think it is going to add new capabilities quickly because they are doing things on 2-year

centers. I think it is going to add resiliency to the architecture. I like their culture. I am looking forward to them coming onboard and I don't see any major changes in terms of how they do business or their culture.

Senator Cramer: That is great. Thank you. Thank you for that.

Continuing along that topic, then, for a moment in the culture of innovation and rapid acquisition, MTA, Military Acquisition Pathway was designed to facilitate rapid prototyping and fielding the new threat-driven capabilities and time frames not met by the traditional requirements process.

Do you support granting SDA Middle Tier Acquisition authority so that they can continue to move fast, then?

Mr. Calvelli: Yeah, from what I have seen, you know, I think on the Space Force side, there is about eight or nine programs that are used in 804 authorities. It has allowed them to go a little bit quicker.

We talked earlier about the fact that speed is really what this nation needs, and so, yes, I would support them having 804 authorities.

Senator Cramer: Well, maybe, and since you are on such a roll, and I am tracking with you, maybe talk a little bit more about the procurement enterprise and the reorganization and how you see that playing out, so we can, I always like

to say, move at the speed of China, but I am not sure if that is the right way to put it or not, but I just know we need to be fast.

Mr. Calvelli: Yeah, so I am still getting my are arms around it. So, clearly, you know, and under my portfolio now is Space Systems Command, then you have SDA coming onboard on October 1, and then you have got Space RCO. You know, all three are unique in their own way and all three have sort of their own unique characteristics. I am not a big proponent of reorgs; I just think they are boring, they are messy, and they get nothing accomplished. So, I am looking forward to actually having these three separate elements in the portfolio and making sure they have the authorities, responsibilities, and we have the right things in place to go ahead and gain that speed and take advantage of each one's distinct strengths.

Senator Cramer: Well, Secretary Plumb, I am out of time, but I was going to ask you, basically, the same question about cyber, and probably the role of commercial and integration of all of that, if you have a quick answer or just as a thought, that would be helpful.

Mr. Plumb: You know, Senator, I think that the cyber piece here, if that is what you are asking, is really important. And while I don't think we fully have our hands around it, defense, in-depth for satellite architecture is

hard, for ground stations, it is hard. And I am in a lot of meetings about this, where we have to break through this idea that there is just a defensive perimeter, and people know this now, but getting to this is a journey.

Senator Cramer: Well, be open with us as to how we can help, whether it is a policy issue or an oversight issue, because we need, you know, we need that culture cultivated.

But, thank you for sharing.

Thank you, Mr. Chairman.

Senator King: Thank you. We will have the second round.

Senator Fischer?

A very practical question. I have heard the word "GPS" mentioned maybe six or eight times so far this afternoon. What if you are in an F-35 in conflict situation 35,000 feet about the Pacific and GPS goes off, what is that pilot able to do?

General?

General Thompson: Senator, I need to be careful, because I am neither a pilot, nor that familiar with the F-35, but I will tell you absolutely there are concerns with many of our systems today and their inability to navigate effectively over the long term with GPS denial.

Now, obviously, we do train, in fact, before I left the Air Force and transitioned to Space Force, we do train our

pilots and their systems in a GPS-denied environment and how to respond. And so, their ability to aviate and fly safely is generally assured, but, obviously, there is likely to be a mission impact.

But, it does absolutely go to your point that while GPS is the world standard, it is perhaps, fair to say we have come to rely on it solely and exclusively and too heavily, and certainly within the Department, there are activities ongoing to augment it, to supplement it, to provide additional means of being able to navigate and position and conduct missions.

Senator King: I would think it would be a high priority. I remember several years ago hearing that Annapolis was going back to teaching celestial navigation, but I understand they really aren't. They are talking about it, but they haven't really done it.

But somebody has got to be thinking about this because in a conflict, if I am the adversary, the first thing I am going to do is try to knock out GPS in order to blind us.

General Thompson: Senator, inside all of the services, especially inside, the Army is probably leading right now. The Navy is not far behind. But the Air Force, as well, they are looking at a host of technologies and methodologies for positioning and navigation.

The one that you specifically referred to, in fact,

they are developing techniques for celestial navigation automatically, without a navigator, a human navigator, required.

Senator King: There has got to be a way to automate a sextant.

General Thompson: Yes, sir, absolutely.

And, frankly, to be able to do it in daylight when the human eye can't see stars. There is technology in that regard.

Many years ago, onboard navigation and inertial navigation systems were the way we conducted business in the 1950s and 1960s before GPS was rampant. It is time to reinvest in those technologies and those capabilities, I think, to advance them.

There is even techniques that allow systems to measure the magnetic field of the earth and based on the variations in the earth's magnetic field, figure out where you are. Terrain mapping. There are a lot of ways to solve this problem and I would say probably inside the Department of Defense, I think we finally have enough people who have woken up to the fact that GPS is the world standard, will remain the world standard for a long time, but we have to be prepared for those who wish to deny us GPS and operation to be able to fight through and defend.

Senator King: Thank you. I appreciate that and I hope

that that is an urgent consideration.

Dr. Plumb, in your testimony, you said something, touched on international discussions, international negotiations. How is that going? Is that real? Is there any interest? I mean, this strikes me as an area where we could have a space version of UNCLOS, not that we couldn't get that through the Senate, but --

[Laughter.]

Mr. Plumb: That is -- I will leave that joke on the table.

Senator King: Yeah.

Mr. Plumb: But, Senator, actually, the United Nations open in a working group is just meeting. I will point out that Canada has joined us in their commitment to not conduct destructive ASAT testing, which is one small piece of this. There are several other like-minded nations in support.

Our goal there is, you know, a fewfold. One is to go with an open mind and welcome ideas on ways to increase transparency and ensure a stable space environment. The fact that these discussions are ongoing in looking at a way to build both, norms and hopefully keep debris-mitigation standards in force. Right now, we have UN mitigation guidelines, but not everyone follows them. There is quite a bit going on.

You know, we are right at the beginning of it, but I

think there is value and there is momentum. I do think the vice president's announcement gave us a little bit of a kickstart, which helps, too.

Senator King: Final question: Is there systematic coordination, and by that, I mean an organized council or some body that does the coordination between Space Force, NRO, NASA? I mean, I just worry that we are, there may well be duplication and overlap in terms of launch and satellite development.

I would hate to, I mean, I know from the Intelligence Committee, we spend a lot of money with NRO on satellites and I would hope that there would be coordination so that we are not duplicating.

Mr. Calvelli: Actually, there is. From my time at the NRO, there actually used to be, and I think there still is, quarterly meetings with NRO, NASA, and the Air Force to, and now the Space Force, just to make sure that they do coordinate and understand what each one is working on. So there is actually a pretty tight relationship across all three of those organizations.

And inside the Space Force, there is the Space Acquisition Council that this committee put in place that helps to integrate across all of the services across the Pentagon for space features and then SSC and other teams have a lower-level council called the Program Integration

Council, does the same, as well.

So, there is actually, sir, a lot of teamwork going on across the community for space.

Senator King: Good. Thank you.

Senator Fischer?

Senator Fischer: Thank you, Mr. Chairman.

Dr. Plumb, Section 1609 of last year's NDAA required the Department to review the classification level of space programs to determine whether they could be reduced or declassified. And it is my understanding that you are leading this effort. Can you update us on the status, please?

Mr. Plumb: Yes. Thank you, Senator, for this opportunity.

So, I have been looking at that. My team has been looking at it and looking at it with General Raymond's staff. That is an enormous tasking. It is far beyond any 90-day deadline.

I think, fundamentally, the place I am going on this, and I am speaking for myself here, not the Department yet, is that probably all of those things, the hundreds and hundreds of things that are classified for the Space Force are probably appropriately classified. And the fundamental question is, does the classification guide need to be redone, which is sort of a follow-on task.

So, I will be working with you and this committee, as well as on the House side, to try to find the right way forward to make this scope correctly. And if that is the test that we need to get addressed, then we need to get to that.

Senator Fischer: Are there any efforts being made to declassify threat information that we receive?

Mr. Plumb: So that, of course, is not that 1609 piece, but it is important. I will note that DNI Haines annual threat assessment that just, I think she was on the Hill yesterday on it, it is stamped February, but I just saw a copy of it yesterday, so it does go farther than I think previous things on both, as General Thompson has been pointing out, as well.

You know, China and Russia both have on-orbit and ground-based antisatellite systems targeting U.S. and allied satellites. I think that is a new statement.

So, there is some effort there. You could argue whether we could do more, but, you know, all of these things, we have to be careful about what would we, you know, what is the intelligence gain and loss on any of these issues.

Senator Fischer: Yeah, you know --

General Thompson: Senator?

Senator Fischer: Oh, go ahead.

General Thompson: Senator Fischer, if I may?

The Defense Intelligence Agency just released a very extensive, unclassified report about competition in space. I have not seen that level of communication on, in an unclassified sense into adversary threat systems in a long time. It is a very good product and I think it has taken us a long way where we need to go in terms of communicating those threats.

Senator Fischer: Okay. I think it is extremely important, without putting any of our people or our systems or our ways that we find information in jeopardy, to be able to get some kind of information out to the public, but also to certain think tanks who assume that they understand what is taking place in classified briefings and they don't even sometimes come close to what is discussed in those briefings and they make statements and generalizations and they take positions on false information.

But I think it would be especially helpful, as I said, for the public to understand threats that this country faces and I do believe our people would be very, very supportive of programs that are in place, or that are being put in place, to protect this country. Thank you.

Senator King: Senator Tuberville?

Senator Tuberville: I want to ask one crazy question here. Is there, with the need of speed in the future, is

there any thought of nuclear power in space?

Mr. Plumb: Absolutely, there is. NASA, I think, has a large portion lead. If DOD is working on it, I haven't uncovered that piece yet. But, roughly, there is a lot of advantage to some form of nuclear propulsion, long-duration missions, including manned missions, you know, a larger power source. These are being looked at, but space nuclear propulsion is an expensive thing to look at and do safely, and in practice, but it is being worked. I think NASA has the lead.

General Thompson: Yes, Senator.

Recent national space policy has reinvigorated to look at nuclear power for electrical power generation and for nuclear propulsion; in fact, the Defense Advanced Research Projects Agency has a nuclear propulsion prototyping activity going on.

But in terms of NASA, NASA is looking at potential nuclear power for use for moon-basing. We are absolutely looking at it for propulsion and power generation on orbit going forward.

Senator Tuberville: If we are going to do any planet-hopping, you know, getting there a lot quicker is going to make it, in the future, you know, Star Trek and all that stuff.

I have one company, and my NSA told me about it, EOS

Defense Systems, they have a low-cost method of removing space debris. Have you ever heard of them out of Huntsville?

General Thompson: Senator, I have not, specifically.

I will tell you that our space works, our innovative engine for space activities in a project called Orbital Prime, just put out a call to research activities and proposals, recently awarded 125 different initiative contracts to go forward. It is very possible, I don't know for sure, it is very possible they are one of those companies. But it is specifically focused on that young, innovative, early companies looking for ways to help us with the debris problem. It is very possible they are part of that, but, unfortunately, I can't tell you for sure that is the case.

Senator Tuberville: That is a good idea, you know, commercially doing it, making money out of it. We can send those names to Russia and China so they can clean up their mess as we go.

So, thank you all very much.

Thank you, Mr. Chairman.

Senator King: Senator Cramer, any additional questions?

Senator Cramer: None from me, thank you.

Senator King: Thank you.

Well, thank you very much. It has been a very informative hearing. I appreciate your testimony today and as I said, I want to reiterate what both, Senator Fischer and I and Senator Rounds mentioned: Any thoughts, ideas, suggestions, desires, in terms of the National Defense Act, get them to us in very short order.

Thank you very much. This hearing is adjourned.

[Whereupon, at 5:40 p.m., the hearing was adjourned.]