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SPACE POSTURE REVIEW AND THE FISCAL YEAR 2011 NATIONAL DEFENSE AUTHORIZATION BUDGET REQUEST FOR NATIONAL SECURITY SPACE ACTIVITIES

HEARING

BEFORE THE

STRATEGIC FORCES SUBCOMMITTEE

OF THE

COMMITTEE ON ARMED SERVICES
HOUSE OF REPRESENTATIVES

ONE HUNDRED ELEVENTH CONGRESS

SECOND SESSION

HEARING HELD
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SPACE POSTURE REVIEW AND THE FISCAL YEAR 2011 NATIONAL DEFENSE AUTHORIZATION BUDGET REQUEST FOR NATIONAL SECURITY SPACE ACTIVITIES

HOUSE OF REPRESENTATIVES,
COMMITTEE ON ARMED SERVICES,
STRATEGIC FORCES SUBCOMMITTEE,
Washington, DC, Wednesday, April 21, 2010.

The subcommittee met, pursuant to call, at 2:15 p.m., in room HVC–210, Capitol Visitors Center, Hon. James Langevin (chairman of the subcommittee) presiding.

OPENING STATEMENT OF HON. JAMES R. LANGEVIN, A REPRESENTATIVE FROM RHODE ISLAND, CHAIRMAN, STRATEGIC FORCES SUBCOMMITTEE

Mr. LANGEVIN. Good afternoon. This hearing of the Strategic Forces Subcommittee will now come to order. Today we will take testimony on the Administration's Space Posture Review (SPR) and the Fiscal Year 2011 National Defense Authorization Request for National Security Space Activities.

I want to, first of all, welcome all of our witnesses here today. First, we have General Bob Kehler, Commander of the U.S. Air Force Space Command. He is responsible for organizing, training, and equipping space and private space forces for the North American Aerospace Defense Command, the U.S. Strategic Command (STRATCOM), and other combatant commands around the world.

Previously, he was Deputy Commander of STRATCOM. He served in the Air Force for over 35 years with tours in intercontinental ballistic missile (ICBM) operations, space launch and space operations, missile warning, and space control. During his service, he earned a Master's in Public Administration at the University of Oklahoma in Norman and a Master's in National Security and Strategic Studies from the Naval War College in Newport, Rhode Island. I have heard something about that, General. Great job there. So welcome, General. Appreciate you coming back and testifying here once again. It is great to be with you.

Next, Mr. Robert Butler, Deputy Assistant Secretary of Defense for Cyber and Space, has agreed to appear before the committee today to discuss the interim Space Posture Review and the status of the Administration's work on space policy. Mr. Butler is a former Air Force officer with over 30 years of experience in intelligence and communications-computer systems. He earned an MBA from the University of Maryland. Welcome to you, Mr. Butler.

Our third witness, Ms. Betty Sapp, Principal Deputy Director of the National Reconnaissance Office (NRO). It has become a tradition of the subcommittee to have an NRO witness discuss the un-

classified aspects of your agency's mission at our yearly hearing. And Ms. Sapp is also a former Air Force officer and previously served as Deputy Under Secretary of Defense for Intelligence from 2007 to 2009. She earned an MBA from the University of Missouri, Columbia. Welcome to you, Ms. Sapp.

Finally, we will hear from Mr. Gary Payton, Deputy Under Secretary of the Air Force, on the status of space acquisition programs. Mr. Payton retired as a colonel from the Air Force. In the course of his 23 years of service, he flew as a payload specialist onboard the Space Shuttle Discovery.

He also directed the development of missile defense sensor and interceptor technologies while at the Strategic Defense Initiative Organization and, more recently, served as Deputy for Advanced Systems at the Missile Defense Agency. He has a Master's Degree in Aeronautical and Astronautical Engineering from Purdue University in Indiana. And I want to welcome you, Mr. Payton and, again, our entire panel here this afternoon.

Well, in addition to thanking you for being with us here today, let me say that the United States has unparalleled space capabilities, as we all recognize. These capabilities are the underpinning of our military superiority, our global communications, and directly support our intelligence capabilities and, in fact, our way of life.

At the same time, our space dominance underscores our dependence on space-based assets, which have become increasingly vulnerable as space becomes more congested and other countries develop the ability to hold at risk our satellites, our capabilities and, in fact, our operations.

Several events in recent years have increased the urgency for an effective strategy to protect our military and economic advantages in space: as we know, in 2007, China conducted an anti-satellite (ASAT) test and, in 2008, a defunct Russian satellite collided with a commercial communications satellite, just by way of a couple of examples. These two events, which created unprecedented amounts of space debris, underscore the risk that an attack or accident could pose for continued effective operation and safety of U.S. space assets.

Compiling the challenge, space is becoming more competitive. European nations are expanding their commercial and military space capabilities, while India, Japan, South Korea, Brazil, Iran, and North Korea are all developing indigenous space capabilities. These developments have created challenges for protecting our assets, but also opportunities for collaboration that could support U.S. strategic long-term goals and interests related to security, commercial, and the civil sectors.

The National Defense Authorization Act of Fiscal Year 2009 required the Secretary of Defense and the Director of National Intelligence to conduct a comprehensive review of our national security space posture. On March 12, 2010, the Administration submitted an interim report, but indicated that the final posture report cannot be completed until the White House establishes the broader, national space policy. As a result, we understand that the final national security posture review is not likely to be available until later this year, but we hope that when both the national policy and

the Military Posture Review efforts are complete, they will have answers to key questions about our space capabilities.

For example, how do we adequately defend or, if need be, reconstitute our capabilities? What are the potential gaps now and in the future? How can we maintain the industrial base to produce the needed satellites, ground equipment, software, and launch vehicles that we need? Can we find ways to deliver these products within established schedules and budgets? And finally, how can we strike the balance between developing technical solutions and pursuing diplomatic approaches to ensure that U.S. space assets are protected from attack or disruption?

During the hearing today, we hope to hear a variety of perspectives on the challenges that we face in national security space.

General Kehler, as you contemplate your responsibilities for organizing, training, and equipping our space forces, I am particularly interested in hearing what, in fact, keeps you up at night. What are the most important challenges that you face, and what should we be doing to ensure that you continue to deliver space capabilities to our warfighters?

Mr. Butler, I look forward to hearing your insights on the progress that is being made to establish an overall national space policy and the work remaining to complete the national security space posture. We hope you can also share with us any additional findings from these ongoing efforts.

Ms. Sapp and Mr. Payton, as you know, space acquisition programs have had a poor history of performance over the past decade. During your testimony today, I would like each of you, if you would, to provide us with your assessment of the progress being made to address cost and budget problems. Could you also identify the key challenges that remain in achieving stability in the acquisition process?

And finally, I would be interested in the views of each our witnesses on how to best organize the national security space enterprise. Each of you has had a long and distinguished career in the field. We ask how we can better align the national security space enterprise to rapidly respond to the challenges that we face.

With that said, I again want to welcome you here today. We appreciate you appearing before the subcommittee and we look forward to your testimony in just a few minutes. Before that though, before hearing from the witnesses, I would like to now turn to the Ranking Member for any comments that he may have. Mr. Turner is now recognized.

STATEMENT OF HON. MICHAEL TURNER, A REPRESENTATIVE FROM OHIO, RANKING MEMBER, STRATEGIC FORCES SUBCOMMITTEE

Mr. TURNER. Thank you, Mr. Chairman. I want to join you in welcoming General Kehler, Mr. Butler, Ms. Sapp and Mr. Payton. I want to thank you all for your dedication, your expertise, and for being here today to be able to answer some of our questions and to give us highlights of the issues that you think are the most important.

I would like to start by highlighting the interim report on the Space Posture Review, SPR, that the committee received in March.

It described today's on-orbit and soon-to-be-launched satellites, but doesn't describe a future space posture. One could provide the same critique of the interim SPR as Ranking Member McKeon did of the Quadrennial Defense Review (QDR). He said, "We find a QDR that basically reinforces the status quo despite serious threats to our current capability. Thus, this QDR provides a force structure that is built for the wars we are in today, when the purpose of review is exactly the opposite—to prepare for the likely conflicts of tomorrow. One must ask: what is new here?"

Well, I understand that the committee will receive the final Space Posture Review later this summer and after a few national space policy and strategy issues have been reviewed and developed. I encourage the Administration to provide a forward-looking posture that will guide near-term and future investments in space.

With respect to the budget requests, a major space acquisition program such as advanced extremely high frequency (AEHF), Wideband Global Positioning (WGS), Mobile User Objective System, Global Positioning System (GPS), and Space-Based Infrared System (SBIRS) appear funded consistent with the previous plans despite a 7 percent topline reduction. Finishing these acquisition programs and giving them on-orbit is important. Equally important are the investments in next-generation science and technology and innovation and ingenuity that can lead to new—and sometimes revolutionary—capabilities, yet these investments appear to be on the decline. How can our Nation retain its leadership in space if our science and technology investments are on the decline? Our committee required a Space Science and Technology Strategy in last year's defense bill and I look forward to receiving that in the future.

I would like to highlight a few other concerns that I hope our witnesses can address. First, I am deeply concerned about the industrial base for solid- and liquid-fueled rockets. Some defense officials have suggested that Air Force space launch costs could double in the out-years due to the termination of the National Aeronautics and Space Administration's (NASA) Constellation program because all infrastructure costs currently shared by the Department of Defense (DOD) and NASA may be passed on to DOD. Exacerbating this issue is the apparent lack of any real new development effort to sustain the engineering and design talent, and a lack of funding to sustain unique production and manufacturing capabilities, particularly for ICBM solid rocket motors. So what is the magnitude of this issue and how is the department—and the interagency—approaching it?

Second, the Defense Intelligence Agency recently issued guidance that restricts the National Air and Space Intelligence Center, NASIC, from doing 'original analysis' in certain counterspace areas. I understand that many of your organizations have a long history of reliance upon NASIC's technological expertise and analysis. Limiting their ability to continue to provide such support cannot be in our best interest, especially with the Department's increased emphasis on space situational awareness and space protection.

Third, we saw a major change in the joint National Polar-orbiting Operational Environmental Satellite System (NPOESS) weather satellite program. The committee was told that differences be-

tween DOD and the National Oceanic and Atmospheric Administration (NOAA)/NASA could not be resolved. The White House decided in February to restructure the program and allow each party to go its own way. However, neither DOD nor NOAA and NASA appeared to have a clear way forward.

It has been over a year since the Transformational Satellite Communications Program was terminated, yet we still don't have a plan for the way ahead in military satellite communications. I am concerned that we see the pattern repeat itself with the way ahead after NPOESS. Any insight our witnesses can share on these activities is appreciated.

Fourth, I hope our witnesses will discuss their views on Operationally Responsive Space, ORS. Later this year, an ORS satellite developed in response to a United States Central Command urgent need is planned for launch. Last December, General Chilton issued an urgent need request for options to augment the missile warning constellation. Is this the right role and focus for ORS?

Lastly, we are fortunate to have witnesses that are also experts in the cyber domain. General Kehler and Mr. Butler, I am interested in your assessments of the Department's cyberspace capabilities and challenges. What are the Department's goals, and does it have the policies, tools, people, and resources to achieve them?

I want to thank you all again for being with us here today. You each possess a tremendous amount of expertise and insight into our Nation's space policy and capabilities. Our Nation is better off as a result of your service, and I look forward to your testimony today. Thank you.

Mr. LANGEVIN. I thank the ranking member. We received a prepared statement from each our witnesses and these statements will be entered into the record without objection. So if you could, please summarize the key points so that we have sufficient time for questions and answers. And we will begin with General Kehler.

STATEMENT OF GEN. C. ROBERT KEHLER, USAF, COMMANDER, AIR FORCE SPACE COMMAND, U.S. AIR FORCE

General KEHLER. Thank you, Mr. Chairman. Mr. Chairman, Representative Turner, distinguished members of the subcommittee, it is an honor to appear before you today, both as an airman and as the Commander of Air Force Space Command. And on behalf of the 46,000 men and women of Air Force Space Command, thanks for your continued support, both of the United States Air Force and of the capabilities we provide to the Joint Force Commanders.

I am very proud to lead a team of active duty airmen, Air National Guardsmen, Air Reserve Command personnel, government civilians, and contractors who deliver space and cyberspace capabilities to America and its warfighting commands around the globe. Everything we do begins and ends with the needs of the Joint Force Commanders, and our measure of merit is how well we contribute to the joint team, to civil needs and, in the case of GPS, a global user base that expands every day.

Space and cyberspace capabilities provide our forces with the ability to navigate with accuracy, see with clarity, communicate with certainty, strike with precision, and operate with assurance. These capabilities are woven throughout the fabric of our joint

warfighting activities and our everyday lives. No question we have tough challenges ahead. Space is becoming more contested and congested, but we have rounded a few corners and are proud of the progress we have made since we appeared before you last year.

Special thanks again to this committee, its leaders and its members for taking the time to understand these important issues and for providing the support we need to remain a critical part of the joint team. And with that, sir, I look forward to your questions.

[The prepared statement of General Kehler can be found in the Appendix on page 25.]

Mr. LANGEVIN. Thank you, General Kehler. Mr. Butler, the floor is yours.

STATEMENT OF ROBERT J. BUTLER, DEPUTY ASSISTANT SECRETARY OF DEFENSE FOR CYBER AND SPACE POLICY, OFFICE OF THE SECRETARY OF DEFENSE

Mr. BUTLER. Thank you, Mr. Chairman, Representative Turner, and distinguished members of the subcommittee. I am pleased and honored to testify today on behalf of the Department of Defense and Space Policy. As you mentioned in your opening statement, we have delivered an interim Space Posture Review which characterized the space environment in the terms of three Cs: congested, competitive, and contested.

From the standpoint of congestion, we have talked about a couple of examples already. It is a key element of what drives and what will drive our response in terms of the future of our space strategy. It is not only about debris management, but it is also about spectrum and how we deal with that as well.

In terms of the competitive environment, we are in an international space business of $250 billion, with 60 nations or commercial entities involved. We are working through, now, an environment where we are not at it alone, and that presents its challenges and we are working through responses with regards to the competitive nature.

And then with regards to the last C, dealing with the idea of contested, we mentioned some examples about the Chinese ASAT, but we also have nations trying to jam our commercial signals and we are, again, engaged in developing responses to deal with that. That environment then causes us to think through the kinds of things that we will be focused on as we move forward with a national space policy, the national security space strategy, and where we are going in the future.

Some of the areas that we are exploring extensively is space situational awareness. As you mentioned, the Department of Defense was given the responsibility for providing space situational awareness. We have, over the last year, taken on that responsibility, and Strategic Command in particular is now working to implement a concept of operations to help us with that as we move forward.

In addition to dealing with space situational awareness and the sharing of that information, we are also working extensively within the Department to look at operations without space in a degraded environment, based on the fact that space is contested.

A series of tabletops and war games, the Schriever 10, sponsored by General Kehler and Air Force Space Command coming up next

month provides an opportunity for us to continue to walk down that path and look at issues regarding replacement, augmentation and redundancy, a well as resiliency.

Beyond that, we are also focused on looking at different ways of sharing and engaging, both on the international side and commercial side. So in response to your questions about the differences with regard to where we are headed, it is no longer a kind of 'go it alone' strategy. It is a foreshadowing of where we were going to go in terms of partnerships.

On the international side, we have currently military-to-military relationships, as well as intelligence relationships. Those relationships give us the opportunity to grow in the future with helping each other in an interconnected world.

Beyond that, on the commercial side, we have been involved with looking at commercial capabilities to help us with communications, as well as remote sensing augmentation to national systems, as well as what we are doing with expansion of wide-band communications to help us on the commercial augmentation side.

These are just some of the themes that we are looking at as we move forward beyond the characterization of that environment to begin to address the challenges of a congested, competitive, and contested space.

I look forward to your questions.

[The prepared statement of Mr. Butler can be found in the Appendix on page 43.]

Mr. LANGEVIN. Thank you very much, Mr. Butler.

Ms. Sapp, the floor is yours.

STATEMENT OF BETTY SAPP, PRINCIPAL DEPUTY DIRECTOR, NATIONAL RECONNAISSANCE OFFICE

Ms. SAPP. Chairman Langevin, Ranking Member Turner, and distinguished members of the committee, thank you for the opportunity to be here today. On behalf of General Carlson, I would like to just start with a little bit on where the NRO is today.

You know, from launching the most technically-capable systems, to keeping legacy satellites flying, to developing the business practices that secured a clean financial audit for the NRO, we believe the NRO remains the premier space reconnaissance organization in the world.

We have had significant successes in the last year, and the NRO is wholly focused on continuing that record of success by delivering the space reconnaissance capabilities the Nation requires, on time and on budget.

I would like to end my opening remarks today by highlighting a critical mission for the NRO, which is supporting the warfighter, with a specific story. Last month, a helicopter went down in a remote location in Afghanistan. With no organic intelligence, surveillance, and reconnaissance assets available to the Army brigade involved, the brigade's intel staff requested immediate imagery assistance from a combined NRO–National Geospatial-Intelligence Agency cell. We were able to rapidly provide multiple images of the area on the very low bandwidth connection that they had available to them. It allowed key imagery intelligence to be provided to the operations and rescue teams within minutes. The craft site was

quickly secured and protected, and 14 wounded soldiers were safely rescued.

One of the intelligence officers involved relayed the following to us: "I wanted to pass on my sincere thanks for your support that night. An aircraft down is one of the worst things we can experience as a unit and your timely imagery support was pivotal to the rescue teams."

This is just one example of the NRO's living its vision of vigilance from above.

Mr. Chairman and members of the committee, thank you for the opportunity to appear before you today, and I thank you for your continued support to the NRO and look forward to answering your questions.

Thank you.

[The prepared statement of Ms. Sapp can be found in the Appendix on page 51.]

Mr. LANGEVIN. Thank you very much.

Mr. Payton, the floor is yours.

STATEMENT OF GARY E. PAYTON, DEPUTY UNDER SECRETARY OF THE AIR FORCE FOR SPACE PROGRAMS, U.S. AIR FORCE

Mr. PAYTON. Mr. Chairman, again, thank you for the invitation to appear before the committee and the opportunity to discuss the Air Force space program.

2010 is an important year for us. Within a few weeks, we will be launching the first of the next generation of GPS spacecraft, 2F–1, that will provide a new civil signal for the world, a signal designed specifically for safety of life applications in a part of the radio frequency spectrum that is better protected from interference. That will launch, currently scheduled on the 20th of May.

Later, in July, we will be launching the Space Based Surveillance System. This will provide 24–7 observations of space objects unhindered by atmospheric effects. Later in July, we will be launching the first of the Advanced Extremely High Frequency (AEHF) spacecraft. This is a large step in the protected communications constellation, offering 10 times the aggregate through-put of each spacecraft and five times the data rate of the legacy systems.

Also, this is the communications system that provides the President nuclear command and control for our deterrent forces. So this is a critical mission and a large increase in capability.

Finally, later in 2010, we will launch the first of the ORS spacecraft, specifically designed to satisfy an urgent need of a theater commander. This will satisfy a capacity shortfall in surveillance and reconnaissance for Central Command.

Again, from the start of the program to the launch will consume only two years. And so again, as a measure of responsiveness, this is a huge step forward.

Thus, in 2010, we will see Air Force expanding our capacity on communications constellations, improving our accuracy of the GPS constellation, responding to urgent warfighter needs, and large strides in our space situational awareness, all delivered in 2010.

And none of that would have been possible without the help from this committee and Congress.

And so the Air Force thanks you and, more importantly, the joint warfighter thanks you.

I eagerly await your questions.

[The prepared statement of Mr. Payton can be found in the Appendix on page 60.]

Mr. LANGEVIN. To the panel, thank you very much for your opening statements.

Let me begin with General Kehler. As I talked about in my opening comments, as you contemplate your responsibilities for organizing, training, and equipping our space forces, we obviously are interested right now, General, in what keeps you up at night. What are the most important challenges that you face? And what should we be doing to ensure that we can continue to deliver space capabilities to all of our warfighters?

General KEHLER. Thanks, Mr. Chairman.

Well, first of all, I would tell you what doesn't keep me awake at night. What doesn't keep me awake at night are our day in and day out space operations. Once we put the platforms in the hands of our young men and women, they produce remarkable results. And I think Ms. Sapp's vignette was very appropriate. We hear those kinds of results from the forward forces all the time.

In addition to that, I think we let our performance in launch, where we have had now almost 10 years worth of launch successes, and we allow our performance in GPS, which has now become the gold standard for the world, to speak for themselves. And so what does not keep me awake at night are the operational activities that we conduct with those space capabilities that you all have supported and put in our hands.

What does keep me awake at night, though, are a couple of things. One is, if we want to continue to have a world-class Air Force and a world-class space and cyberspace capability, we have to have world-class people. And this is an all-volunteer force and we are in competition for people. That is particularly true, and we have seen that over the years in the space professional ranks where we compete with civilian industry for our space professionals. But in particular as cyberspace is emerging, that is going to be an acute issue for us as we go forward, is how do we recruit and retain those people with the appropriate expertise in cyberspace?

So people and recruiting and retaining—around our command, we call this, we want to build a world-class team of battle-ready professionals. And that keeps me awake at night, is are we doing the right things to do that? Are we stimulating the right educational incentives, *et cetera, et cetera.*

The second thing that keeps me awake is the industrial base. We have concerns about the long-term viability of our industrial base. It is a far different industrial base than it has been in the past. There are many reports, and many folks have studied the industrial base and they all report that there is more fragility, if you will, in the industrial base than there has been in the past, which makes the industrial base more sensitive to changes than they have been in the past.

And so that also concerns me, that I ask myself all the time: Are we positioning ourselves correctly to make sure that our successors will be able to look back and say they have given us the right people to do the jobs that we need and they have left us the appropriate industrial base to do the job that we need to get done? And so those two things keep me awake at night.

The final thing that is on my mind quite a bit, of course, is making sure that we are adjusting, and this gets to Representative Turner's question about the future. No question about it: we have focused on deploying those things that have given us such acquisition difficulties. And we have committed ourselves to that. We have turned important corners. And already, as Mr. Payton just very, very adequately talked about, the number of things that will happen in 2010, we are there because of the dedication and hard work of a lot of people in the government and in the industrial base that supports us.

And so we have a way forward here for the near future that is, essentially, the platforms that Mr. Payton just mentioned—GPS–2F, Advanced EHF, Space-Based Infrared System as it comes off the factory floor later this year, and I have got confidence that it will come out of the factory floor, *et cetera.*

The question is: What comes next? And it is time for us now to start thinking about what comes next. We have block improvements planned for many of these capabilities, but I am concerned that we pay attention to innovation as we look to the future and make sure that we are in a position to innovate, as we have done in the past, at the appropriate times in the appropriate ways, so that we can continue to provide the leading edge capabilities that we need.

Those three things, sir, are the things that are keeping me awake at night.

Mr. LANGEVIN. Thank you, General.

And on the—let me go back to the cyber component of your answer since that is something that I pay a lot attention to as well.

Does the Cyber Command that the Pentagon is standing up, will that answer the concerns that you have in those areas? Will that provide both enhanced capabilities, but also a career path for those individuals that we hope to attract and retain in the cyber workforce in our Nation's military?

General KEHLER. Sir, I think that is a big step in that direction. And I believe, you know, the Secretary of Defense has looked at the services and has said, "I need you to be prepared to contribute capabilities and forces to the new U.S. Cyber Command." And so the activities that we have taken to stand up a new numbered Air Force, the 24th Air Force in our case, and to begin new training efforts to set up a new cyber career field to look at how we will acquire capabilities for cyberspace faster because, you know, the shelf-life on information technology-related things is pretty short.

All of those steps, Mr. Chairman, are under way in major part because the Secretary elected to stand up U.S. Cyber Command and has told the services to be ready to contribute forces to that command. So I think that is a big step in the right direction, recognizing that, you know, we are still only a small piece of the bigger

government effort, but it is certainly a stimulus for us, and that positive direction, I think, will make a big difference.

Mr. LANGEVIN. Thank you. On another topic, in 2007 the Commander of the Army Space Missile Defense Command said that within three years, China may be able to challenge the U.S. at a near-peer level in space.

With the Chinese test of an anti-satellite interceptor in January 2007 and the test of an anti-ballistic missile interceptor in this past January, there is a real risk, obviously, to our satellites, that the satellites might not be able to—might not be available in a future contingency.

And I was kind of surprised that, of the things that might keep you awake at night, that redundancy and contingencies were not on the list. But, General, do we have the military operational plans or contingency plans that reflect the possibility that certain satellites may be unavailable during times of crisis and war? And how quickly could we reconstitute?

General KEHLER. Mr. Chairman, the message that we have taken away from the recent activities that we have seen is that space is not a sanctuary. Not only is it a naturally hostile environment, but we have seen through the demonstration of the anti-satellite test and ground-based jammers that are proliferating around the world. You know, I tell people sometimes if you are interested, go to your home computer and go to a search engine on there and type in 'GPS jammers,' and see what you get. You will be surprised, I think. Maybe you won't probably be surprised, but some would be surprised at what you find there.

And so we know that space and the capabilities that are in space are not a sanctuary. The question is, what do we do about that? And in response to our concerns here, a little over two years ago, the Director of the NRO and I decided to put together a joint effort called the Space Protection Program. And that is bearing fruit for us.

We understand that this is about layering protection activities. In some cases and, in fact, in a couple of important cases, I think, we find that the most important thing we can do to protect ourselves is to be able to figure out with high confidence what happened. And that is space situational awareness, and we have to get better at space situational awareness. In fact, the budget request contains some enhancements for space situational awareness.

The second thing we have to do is we have to go back to design and engineering. In some cases we are going to have to build some protection in. Some of our assets today are very well protected. We have mentioned Advanced EHF a couple of times. Advanced EHF is designed to survive in a hostile environment against certain kinds of threats—not all threats, but certain kinds of threats.

Those were design considerations that were taken into account when we were building AEHF. We are going to have to do that in a bigger way. GPS is another example with some design considerations.

The third thing we have to do, and what we are doing is we are adjusting our tactics, our techniques, and our procedures. This gets to the planning question that you asked. Do we have contingency

plans in place? And the answer is, we are in the process of addressing all of those.

Much of this stems from a clear understanding of where our vulnerabilities are and what our interdependencies are with all of the things we use from space for national security purposes. And we have a much better view of all of that today than we have ever had before.

And then finally, contingency planning really gets down to mission assurance. In some cases, we may not want to protect a certain space asset at all. It may be best to back up that capability with something else—an air asset, for example. And so we are looking very carefully at those places where we must protect something in space and then looking at what is the best way to go about that.

So I think we have responded to this concern about space not being a sanctuary—and by the way, that is not new. We can go back to the Cold War. We watched the Soviet Union in those days test anti-satellite weapons, *et cetera.* What is different today is the consequences of loss. I would argue that today the consequences are far greater than they probably would have been, had the Cold War turned into a hot war.

So we are much more mindful of this issue today. It doesn't keep me awake at night, because I think we have got a good handle on it. We don't have all the fixes in place, but I think we have a long way in the last two to three years in understanding where the problems are and coming up with the ways to deal with them.

Mr. LANGEVIN. Very good. Well, on that point there is nothing better to undermine an aggressor's confidence that they can disrupt those capabilities than to have multiple layers of redundancy. And so the more we can do in that area, the better.

Thank you, General, for the work you are doing and for your answers.

Mr. Butler, I wanted to address, if I could, your insights into the progress that is being made to establish an overall national space policy and the work remaining to complete the national security space posture. And we hope that you could share with us any additional findings from these ongoing efforts at this point.

Mr. BUTLER. Thank you for the question, Mr. Chairman.

We have been meeting within the interagency here for the last couple of months now on building up the national space policy. We have a robust process in place that is moving us through a sharing of ideas and common themes that move us beyond guiding principles to a product which we believe will be ready sometime late spring.

We have also gone ahead and, based on what we have been asked to do from the congressional side as well as within the executive branch, begun to sequence these activities in a much more logical way. So the rationale for waiting on the final Space Posture Review was to benefit from the insights of the development of the national space policy and the national security space strategy, which we will be working on as we complete the national space policy.

We are also dovetailing into that in congressionally-directed activity with regard to the space investment strategy and looking at export control reform and the like.

As we move forward in time, the themes that I talked about within the interim Space Posture Review have come up and have been corroborated, for the most part, as part of the overarching characterization of the environment that we will be working in. And as we do that, there is a bridge that we are working across the national security community, the science community and the commerce community as we build the national space policy.

So my sense right now is we have a good, coherent, and integrated plan for moving forward from policy and guiding principles to the ideas for response, and then moving toward an investment strategy that will help us implement those particular principles.

As we move forward, our intent, of course, is to share with you these ideas as we work with the White House and get them agreed upon, and then continue to look at ways that we can build on the principles that I talked about in the latter part of my opening remarks—namely, the ideas of international cooperation, looking at ways that we can build upon, I know, themes that you are concerned about with the industrial base as part of the strategy principles that we would like to implement.

If there is no other follow-up questions on that, I would like to build on the cyber discussion for just a moment.

Mr. LANGEVIN. Well, if—I would like to hear your thoughts on that, but since we are on space policy and Space Posture Review, we haven't completed it. Could you talk about how we might apply deterrence in space, the threats that we face in the 21st century? Can we deter others from holding our space systems at risk?

What are the merits of a declaratory policy that signals our intent and lays out consequences very clearly? And do you see merit in establishing international rules of the road and/or codes of conduct in space?

Mr. BUTLER. Thank you, Mr. Chairman. All great questions, and all questions that we are in the process of considering. When we think about deterrence, our major focus is on dissuading belligerent actions in space. And it begins with what General Kehler was describing as space situational awareness, having an understanding of what the environment is like in space, and being able to be more predictive about how that environment is changing.

Behind that idea of space situational awareness, then, is the idea of improving the way that we protect our own space capabilities. I mean, it goes back to the space protection strategy that General Kehler outlined.

A key aspect of the thinking more broadly as we build out in this process of deterrence is the idea of working with like-minded nations in different ways. One way in which we look to do that is through space situational awareness and data sharing.

Another way is what you suggested in terms of looking at rules of the road. We have done some of that already as we have worked in our existing cooperation agreements. We have done that with the United Nations over the last couple of years in looking at debris mitigation rules of the road.

In terms of aspects of declaratory policy and red lines and thresholds, we are working through that with the national space policy. And as we work through that discussion and come to some

conclusions, I will be happy to come back and discuss, you know, the specifics with regards to those particular areas.

Mr. LANGEVIN. Good. Well, we would certainly welcome that. Before I turn to the ranking member, you said you wanted to comment on cyber.

Mr. BUTLER. Sure. I would just like to build a little bit on General Kehler's thoughts. We are working within OSD (the Office of the Secretary of Defense) on not only the standup of Cyber Command, but an emphasis area for the Secretary is cyber cadre development. Within that, we are looking at best pre-models that are coming from the different services and looking across generational issues as well as private-public sector cross-flow.

I had the privilege this past weekend to be in San Antonio, where I looked at one of those models, the National Collegiate Cyber Defense competition, where colleges are getting together now and competing in new and different ways on teams to promote and create a dream about being involved with cyber defense.

My sense is, as we move forward with the development of the defense cyber strategy, which is in progress right now, we will have that as a major focus area, which will be a critical element of organizing and resourcing Cyber Command for success.

Mr. LANGEVIN. Very good. Thank you for that additional comment. I have other questions for Ms. Sapp and Mr. Payton. I hope we can do that in a second round when it is my turn, but for now we are going to turn to the ranking member for his questions.

Mr. TURNER. Thank you, Mr. Chairman. We have quite a few members that are interested in asking questions. I am eager to get to their thoughts also.

As I had said in my opening statement, we have concerns about the NPOESS program restructure. The National Polar-orbiting Operational Environmental Satellite System was a joint 50–50 cost share program between DOD, Air Force and NOAA and NASA. It experienced significant technical costs and schedule problems, including a Nunn-McCurdy breach in 2006, but was put back on track.

However, differences among the defense and civilian users could not be resolved, and in February 2010 the White House decided to restructure the program, allowing each party to go their own way. Neither DOD nor NOAA and NASA have made decisions on whether to continue with the current contract with Northrop Grumman or to acquire NPOESS satellite to terminate that contract and pursue an alternative approach.

Without a clear plan, the FY 2011 budget request of $351 million to continue NPOESS system program design may be unjustified.

General Kehler and Mr. Payton, what are your thoughts on the next steps for NPOESS program? And should it be continued by DOD or replaced by an alternative new approach? And are there risks of a gap in capacity and capability?

General KEHLER. Sir, I will start and then defer to Mr. Payton. A couple of things that we know—one is that the decision that was made was to separate the responsibility for providing the satellites in the particular times of the day that those capabilities are needed. We will retain a common ground system and common command

and control, recognizing that all the data has to come and be fused together to be useful for us. And so that is one feature of this.

Second, we have two Defense Meteorological Satellite Program satellites left that are sitting here waiting to be launched. And so we are looking very carefully at when we will have to launch those, given this decision to make sure that we have phased those satellites correctly so that we do not have a gap in the time of the day that is going to be the responsibility for DOD, in particular.

And then the third piece is, we are looking very hard at the requirements so that we make sure that we have now apportioned, if I can use that word, the requirements to the various responsible parties across those orbits to make sure that we have got that lined up right, and we are taking enough time to go back and look at the requirements, because what we know about acquisition programs that have gotten in trouble is that they started off without a clear understanding of requirements. So we are back looking at the requirements there.

And then finally, we are also looking with a mind toward harvesting as much as we can possibly harvest out of the program that has already gone on for NPOESS that has taken us this far. The answers aren't in yet, but we are working very carefully with our colleagues in the Department of Defense and the air staff to make sure that we get the answers right and that we are prepared to go forward smartly when the decisions are made.

And with that, Mr. Payton, I will defer to you.

Mr. PAYTON. I would offer that the Air Force is not going to get out of the business of Lower Earth Orbit weather observation spacecraft. Truthfully, we view Strategic Command as the first among equals for representing the warfighter for global weather forecasting.

And Strategic Command has been very adamant that they cannot tolerate a gap in that early-morning orbit. And so that is the premier objective that we will maintain for future Air Force acquisitions in the Lower Earth Orbit weather mission.

Mr. TURNER. Mr. Chairman, we have votes coming up. To ensure that everybody else gets an opportunity to ask questions, I will defer to the other members.

Mr. LANGEVIN. Fair enough. Thank you. I thank the ranking member. Mr. Lamborn is now recognized.

Mr. LAMBORN. Thank you, Mr. Chairman.

And thank you all for being here. And like I told you each personally, thank you for your service in protecting our country.

The first question is for General Kehler and Secretary Butler, multipart: How will the Air Force Cyber Command work with the new U.S. Cyber Command?

Secondly, will the U.S. Cyber Command have the resources it needs?

And what do you see as key issues in the cyber arena?

General KEHLER. Well, sir, let me start. Again, the first part of the answer is how will 24th Air Force work with U.S. Cyber Command?

We have stood up a numbered Air Force, a new numbered Air Force, that is identical in construction to every other numbered Air

Force that is attached to either the regional combatant commanders or the global combatant commanders.

So, for example, in space, we have 14th Air Force, and that is assigned to U.S. Strategic Command, and that is how we package all of our space capabilities and hand them over to U.S. Strategic Command.

We will do the same thing with our cyber capabilities. We will put them inside 24th Air Force, a step we have already taken. And 24th Air Force will become the Air Force component to U.S. Cyber Command when it is stood up.

In the meantime, it is the U.S. component to Strategic Command where the cyber responsibilities still reside.

So we have constructed our method of presenting operational forces to a combatant commander for cyberspace the same way we do that if it was fighters or bombers or spacecraft or any other part of the family of Air Force capabilities that we bring to the fight.

And I will defer the other parts of the question.

Mr. LAMBORN. Thank you.

Mr. BUTLER. Sir, in terms of the relationship that General Kehler just described for the Air Force, that is exactly what the Army and Navy are doing, in terms of presentation of forces into U.S. Cyber Command.

With regard to the resourcing issue, I think we—one of the key tenets of setting up Cyber Command was to leverage the existing capabilities that we have in place within the Department of Defense.

So as you heard last week in General Alexander's testimony, we are working to ensure that we leverage the technical back plane of the National Security Agency as we build capabilities around that.

In terms of the future resourcing for the command, we have efforts under way to look at what will be required above and beyond.

In terms of the specific issues that we are dealing with U.S. Cyber Command, again, I go back to General Alexander's testimony from last Thursday to the Senate Armed Services Committee. Authorities and policies need to be put in place for greater protection of the networks.

We are working through that. That extends out to the privacy and civil liberties groups, all the way out to doing full-spectrum operations.

Certainly from the standpoint of capabilities, the ability to do rapid technology insertion with continuous risk mitigation is an important element that we need to continue to work on and grow.

And then capacity—and inside of capacity is bridging with not only within our own Department of Defense and with other partners within the interagency, but building capacity with the private sector and building capacity with international partners.

Mr. LAMBORN. Okay, thank you.

And my next question is for Director Sapp and Secretary Payton. And it has to do with budget and resources. I am concerned that this Administration is not prioritizing like it should be with a number of defense priorities to protect our country, as opposed to other budget initiatives that it is taking.

So, specifically, do you think the national security space programs have adequate funding to make sure they can be executed in a timely manner, in support of the various missions?

And what do you see as possible problems, or is everything okay in the near future?

Thank you.

Mr. PAYTON. I will try that first. Our top priority is—and I use the term "constellation health." Other people use the term "continuity of service."

But we have got—the Air Force has several missions in space. And the warfighter needs those services more and more every single day. And so as we lay out the projected lifetime of the spacecraft that are currently on-orbit, and as we project the acquisition time for new spacecraft, that continuity of service is foremost in our minds.

And so that is what underpins our budget request. That is what underpins our acquisition plans. And that is adequate to satisfy that top priority need.

Mr. LANGEVIN. I thank the gentleman. Mr. Franks is now recognized.

Mr. LAMBORN. Well, is it possible that we could hear from Secretary Sapp?

Mr. LANGEVIN. Certainly.

Mr. LAMBORN. Because I think we will still have time for——

Mr. LANGEVIN. That is fine.

Ms. SAPP. I would agree with what Mr. Payton said. We want to make sure that we have continuous service to the warfighter. We are budgeted to support that.

I think where we struggle is to make sure we have continuity for our factories to support the industrial base. And I think we struggle to put new engineering, new capability insertion in those systems.

The research and development investment has suffered over the past several years. So that is where we need to try and recover a bit.

Mr. LAMBORN. Okay, thank you. Thank you, Mr. Chairman.

Mr. LANGEVIN. Thank you. Mr. Franks is now recognized.

Mr. FRANKS. Well, thank you, Mr. Chairman.

I guess I might just take just a quick step from the previous questions. I know that when it comes down to ascertaining our budgets and the things that you need, I understand that probably one of the biggest challenges for space is just the growing hunger for bandwidth.

And I know that, you know, our Global Hawk and the Predator and a lot of these things are demanding more and more bandwidth. And there is a review, a joint review that was due to Congress at some point.

And I guess, General Kehler, I will put the first question to you—not so much—this is not a punitive question. I just appreciate all of you being here and appreciate your service. But, probably, there will be nothing—be a greater leverage, though, and I just want to make sure your budgets are sufficient, knowing what the bandwidth is going to be, so that we can make sure that we are dealing with the need first.

What are your concerns—I mean, when you look back at some of the history, here, there have been cancellations in the last couple years, you know, specifically the Transformational Satellite (TSAT) system, which was set to be, really, a follow-on program for the Advanced Extremely High Frequency satellite, which itself was also a follow-on to Milstar. And that is not scheduled to launch its first satellite until later this year.

So I guess—how can the DOD know, and how can they help us know what those bandwidth requirements are, and where are we in terms of what we need?

And I will start with General Kehler, and then, Mr. Butler, if you would speak to it?

General KEHLER. Well, sir, there are others at the table who can talk about the status of the studies. There is a bandwidth study under way. There is also a study under way looking at the requirements for what we are calling the Joint Space Communications Layer, the JSCL.

There are a number of other studies under way that are coming to grips with this question about, what do we do after Advanced EHF and as we have canceled TSAT?

What I would say is there is an insatiable appetite here. And this appetite—we don't see it actually leveling off. There is always a demand for more and more and more bandwidth.

And the way we have been managing that, to date, of course, is with those things that the government is out buying, now about to deploy the first of the Advanced EHF satellites, already having deployed the third of the Wideband Global satellites, all of which are performing very, very well.

And so we are at the beginning of a huge enhancement to what the government is doing for itself.

And then, secondly, we have been taking up the difference, if you will, with commercial.

We also have allied participation in the satellite communications business. The Australians participate in WGS. Other countries participate in Advanced EHF.

Those three elements, in my personal opinion, form the basis of how we are going to deal with this as we go to the future. There will be a government piece, and that is the piece that we are trying to decide, is how much does the government need to do for itself?

There will be, we think, continuation. There is certainly goodness in continuing allied and friendly participation in some of these programs. And then the third piece is commercial.

The question for us, I think, is what is that mixture as we go to the future? And I think we have some opportunity, here, to look at a way to do this with, maybe, a little bit more flexibility and foresight as we go to the future, and not be working to try to catch up as demand increases.

But, sir, I will defer to those who are a little closer to this.

Mr. BUTLER. Let me pick up on the bandwidth requirement study. We have completed the work within OSD on the National Information Infrastructure side, with our CIO, our chief information officer, and with the National Geospatial Agency.

And that is in coordination. That should be completed—it should be finished, produced and over soon. I know it is late.

We have looked across, you know, a temporal period that takes us from 2008 out to 2023. And it substantiates what General Kehler was talking about, in terms of the expanded communications requirements in narrow-band, wide-band, and protected communications. It is also a kind of a pathfinder for us as we think about how we would implement the types of things that I described in the SPR in international engagement.

It is one of those areas that, you know, we talked about. General Kehler mentioned Australia. It is not just unique to the United States and to the Department of Defense, this communications requirement need. There is opportunity to find ways to share with others and engage with others in this arena.

But the bandwidth study has been completed, and you should be seeing that soon.

I think Gary could take—Mr. Payton could take the TSAT question and provide some thoughts with regard to that——

Mr. PAYTON. TSAT was one of the programs that benefited from a conscious decision to prove the component technologies before we settled on a design for the spacecraft itself.

What we are doing now, over these—current year and the next year is working with the warfighter to find out which one of those technologies should be fielded with the highest priority.

And again, we want to take—we want to be responsive to the warfighter and deploy those technologies on whatever platform is best, but in the order and with the priority that the warfighter drives us to.

Mr. FRANKS. Well, thank you, Mr. Chairman.

Thank you, gentlemen. Thank you to the lady.

Mr. LANGEVIN. I thank the gentleman. We have votes on—at this point, there are just under 8 minutes left on the clock. I have additional questions that I am going to submit for the record, since I took more time than I planned in my opening questions, and I will forego those right now, and I will turn to the ranking member for five minutes or so, the time he needs to ask some additional questions.

Mr. TURNER. Thanks. Looking at the clock, here on the—just on the House floor, with 7 minutes and 26 seconds to go before you all have to finish votes, the interim Space Posture Review: there was—you know, a number of members have made comments of the concern that it was a status quo posture review and that there is more that needs to be eliminated in it.

We heard from Mr. Butler. I guess it would be nice if we took just our last moments to hear from General Kehler, Ms. Sapp and Mr. Payton on—just a few minutes, obviously, for each of you—what are some of the things that are missing that was not in it, in the interim, that you believe need to be addressed?

Mr. TURNER. General Kehler.

General KEHLER. Well, sir, I have—maybe I have a little bit different perspective on this since I know it is an interim report, and I know that there are other pieces that are being worked.

What I think is positive about the interim report is it begins to look at this question of opportunity for the future.

And although we find ourselves in a difficult position here in terms of an environment, a domain that is congested and contested,

and complex—and I think those are the three words that are actually used in the interim report, congested, contested, and complex—it also lays out a way for us to begin to look at the future here that leverages partnership opportunities. And I think that is a positive.

I think that the final report will treat some of the issues a little bit more fully, and I will look forward to that.

Mr. TURNER. Ms. Sapp? Obviously, there are a number of people who have concerns that there are things in it that are missing. What do you see that is missing?

Ms. SAPP. I do not see anything that is missing. I think we have some choices we will have to sort out as we go final with the report. And some of those were brought up, in terms of how declaratory are we, do we really lay out lanes in the road?

I think there are some choices there in what we show and what we don't that we will have to make before we go final with that report, and I think that is some of the things that are in discussion right now.

Mr. TURNER. Mr. Payton, anything you would like to highlight that could be in addition to what we have seen?

Mr. PAYTON. Yes, sir. I helped work on the Space Posture Review, and I read both the interim report and some early drafts of the final report. And just as a foreshadow, I would predict that the final report will have significant—much more substance to it than what we have seen so far.

Mr. TURNER. Great. Thank you. We will look forward to that.

Well, you were all very, very effective. We only have 4 minutes and 46 seconds left, which is a long time for us to get there.

Mr. Chairman, thank you so much.

Mr. LANGEVIN. I thank the ranking member.

With that, I again want to thank our panel today for your statements, for your excellent answers to the questions. And the members, myself included, will have additional questions for you that we will submit for the record, and we ask that you respond expeditiously in writing to those questions.

And, again, thank you for your service to our country.

General, in particular, I hope you will express our deep appreciation to the men and women who serve under you in your command.

And all of you, for the people that you work with as well.

With that, the subcommittee stands adjourned.

[Whereupon, at 3:18 p.m., the subcommittee was adjourned.]

A P P E N D I X

April 21, 2010

PREPARED STATEMENTS SUBMITTED FOR THE RECORD

April 21, 2010

NOT FOR PUBLICATION UNTIL RELEASED BY THE
HOUSE ARMED SERVICES COMMITTEE
STRATEGIC FORCES SUBCOMMITTEE
UNITED STATES SENATE

DEPARTMENT OF THE AIR FORCE

PRESENTATION TO THE HOUSE ARMED SERVICES COMMITTEE
STRATEGIC FORCES SUBCOMMITTEE
UNITED STATES HOUSE OF REPRESENTATIVES

ON

APRIL 21, 2010

SUBJECT: Military Space Programs in Review of the Defense Authorization Request for Fiscal Year 2011 and the Future Years Defense Program.

STATEMENT OF: General C. Robert Kehler
Commander, Air Force Space Command

NOT FOR PUBLICATION UNTIL RELEASED BY THE
HOUSE ARMED SERVICES COMMITTEE
STRATEGIC FORCES SUBCOMMITTEE
UNITED STATES SENATE

Introduction

Mister Chairman, Representative Turner, and distinguished members of the subcommittee, it is an honor to appear before you today as an Airman and as the Commander of Air Force Space Command (AFSPC).

I am proud to lead and represent over 46,000 Active Duty, Air National Guard (ANG) and Air Force Reserve Command (ARC) Airmen, government civilians, and contractors who deliver space and cyberspace capabilities to United States Strategic Command (USSTRATCOM), Joint Force Commanders, and myriad other users every minute of every day. The men and women of AFSPC accomplish their mission from "deployed in place" locations across all 50 states, three territories and Washington DC, while simultaneously serving from forward and deployed locations around the globe.

We have completed an exciting and historic transitional year in AFSPC. In May 2009, we became the Air Force's (AF) lead Major Command (MAJCOM) for cyberspace, and in August, we established a new Numbered Air Force, 24th Air Force, as the AF cyberspace operational component to USSTRATCOM. In response to direction from the Secretary of Defense, 24th Air Force has been designated Air Force Cyber (AFCYBER) to become the AF Component to US Cyber Command, when approved. As we assumed responsibility for cyberspace, we transferred responsibility for the Nation's Intercontinental Ballistic Missile (ICBM) force to the new Air Force Global Strike Command (AFGSC) in December. The Air Force's top priority of reinvigorating our nuclear enterprise remains the number one goal of AFSPC.

Space and cyberspace capabilities shape the American approach to warfare, are embedded in an ever-more effective arsenal of modern weaponry, and are threaded throughout

the fabric of Joint operations. Our integrated space and cyberspace capabilities provide access, persistence and awareness. Through networks, we put the power of a large force in the hands of smaller forces that operate on a distributed battlespace, across all domains and sometimes across different continents. Space and cyberspace capabilities also enable vital civil and commercial activities, including financial transactions, the electrical grid, mass transit operations, personal navigation, cellular communications, emergency services and better farming and fishing operations.

At AFSPC, everything we do begins and ends with the Joint Force Commanders' needs, and our measure of merit is how well we contribute to Joint operations. Our mission is to provide an integrated constellation of space and cyberspace capabilities at the speed of need, and our vision is to be the leading source of those capabilities in the years to come.

The Way Forward

Joint Force Commanders today increasingly rely on space and cyberspace capabilities to enable vital effects across the spectrum of operational needs: irregular warfare, near peer competition, global assessment, and crisis management. Whether conducting combat operations or humanitarian relief efforts, they are facing security challenges that are diverse and dispersed, and an operational environment that is uncertain, contested, and changing. Emerging threats can be fleeting, anonymous, and distributed globally; they may strike anywhere at any time, increasingly taking advantage of the space and cyberspace domains.

In response, AFSPC is pursuing five primary goals: reliable and safe nuclear forces; assured combat power for the Joint fight; professionalism and expertise; modernization and sustainment; and better acquisition.

AFSPC Goal: Guarantee a Safe, Credible, Ready Nuclear Deterrent Force with Perfection as the Standard

The Air Force moved aggressively to reinvigorate the nuclear enterprise by consolidating all strategic nuclear forces under the AFGSC Commander, by aligning all nuclear weapons sustainment and support under the Air Force Nuclear Weapons Center, and by working to expand our nuclear experience and expertise. The transfer of 20th Air Force's three nuclear capable missile wings to AFGSC marked a new chapter in the long, proud history of our nuclear deterrent force. We remain committed to ensuring a safe, credible, ready deterrent force with perfection as the standard. AFSPC will continue to provide personnel, logistics, operations, and fiscal support to AFGSC through FY10.

AFSPC Goal: Deliver Assured Combat Power to the Joint Fight

AFSPC delivers combat power that allows Joint forces to navigate with accuracy, see with clarity, communicate with certainty, strike with precision, and operate with assurance. To do this, our Airmen acquire, launch, operate, and protect US and allied spacecraft, keep watch on adversary activity, and assure space and cyberspace operations. As Joint Force Commanders rely on AFSPC-provided capabilities, the Air Force has requested approximately $11 billion in the Space Virtual Major Force Program, through the FY11 PB to field and sustain leading-edge space capabilities. In addition, approximately $3 billion will transfer to AFSPC in FY11 to grow cyberspace professionals and provide integrated cyberspace capabilities to Joint Force Commanders.

Overseas Contingency Operations (OCO)

In 2009, we forward-deployed more than 2,500 AFSPC Airmen to various locations around the globe in support of combat operations. Approximately 2,100 deployed to the United

States Central Command (USCENTCOM) Area of Responsibility (AOR) in support of Operations ENDURING FREEDOM, IRAQI FREEDOM and Joint Task Force-Horn of Africa. During these operations, 45 AFSPC Airmen were awarded Bronze Stars and two received Combat Action Medals.

Our humanitarian operations are also continuing. AFSPC supported disaster relief efforts during Operation UNIFIED RESPONSE in Haiti. Precise GPS positioning and timing data, satellite communications, and real-time weather services, for example, helped the Joint and multi-national disaster relief team with command and control, search, rescue, and mobility operations, and they distributed sharable situational awareness. Airmen from the 689th Combat Communications Wing, Robins AFB GA, established critical network and communications infrastructure supporting thousands of humanitarian aid flights. In addition, Airmen of the 67th Network Warfare Wing from Lackland AFB TX integrated the mission critical command and control networks of US Government agencies in support of relief efforts.

The FY11 budget request will allow us to continue this legacy of service by enhancing the protection of our space systems and cyberspace networks; improving Space Situational Awareness (SSA); assuring availability of launch; preparing to exploit new Overhead Persistent Infrared (OPIR) capabilities; increasing GPS navigational accuracy, availability, and signal security; modernizing military satellite communications (MILSATCOM); and enhancing our cyberspace posture and operations.

Space Protection

In its first full year of existence, the Space Protection Program (SPP) delivered a comprehensive compilation of space system capabilities and interdependencies to our Nation's key operations centers. This history-making "first" moved us closer to our goal of integrated

space system protection for military, intelligence, civil, commercial, and allied space systems vital to our national security. Through SPP, we have developed a future vision to assure our space capabilities and are evaluating the architecture's effectiveness through the Schriever Wargame Series. On the strategic policy front, SPP personnel delivered the first Space Protection Strategy, supported the Quadrennial Defense Review (QDR), and are contributing to the development of the new National Space Policy and Space Posture Review (SPR).

Space Situational Awareness

In concert with the SPP initiative, we continued to improve our SSA capability as the space domain becomes an increasingly contested, congested, and competitive environment. The collision between an Iridium communications satellite and a Russian Cosmos communications satellite a year ago highlights the critical need for improved SSA. To posture our Nation for the future, AFSPC is filling critical SSA gaps with complementary programs to enhance our capability to detect, track, and identify smaller objects from low Earth orbit out to the geosynchronous belt. Modernizing and sustaining existing sensors greatly contribute to SSA capability. Complementary systems like the Space Based Space Surveillance system, Space Fence and the Space Surveillance Telescope (in cooperation with DARPA), will give us additional capacity to search and track more on-orbit objects, improve our ability to predict potential collisions, provide safety of flight, and rapidly track and catalogue new foreign space launches.

Additionally, we are making sure that the USSTRATCOM Commander will have better C2 and SSA capabilities by combining three programs for the Joint Space Operations Center (JSpOC): Integrated Space Situational Awareness (ISSA), Rapid Attack Identification and

Reporting System (RAIDRS) and Space C2. The effort, named "JSpOC Mission System (JMS)," is under development using a streamlined requirements and acquisition approach.

Along with implementing capability solutions, we refined our tactics, techniques and procedures to reduce the possibility of future collisions. Through JSpOC SSA efforts, our ability to predict collisions increased one-hundred fold to include all active satellites, and now we conduct over 1,000 assessments per day. As a result, there have already been more than 60 instances where owner-operators maneuvered their satellites to avoid possible collisions.

In addition, on 22 December 2009, we transitioned the Commercial and Foreign Entities (CFE) pilot effort into USSTRATCOM's SSA sharing program, with operational responsibility continuing at the JSpOC. Not only do we provide conjunction analysis for capabilities critical to national security and homeland defense, but also we expanded our services to provide positional data to over 40,000 users and a number of partner nations.

Launch and Range Enterprise Transformation (LET)

It is our job to deliver assured space and cyberspace capabilities, and we can only do that if we have assured access to space. We now mark a full decade of successful national security space launches and over seven years of successful Evolved Expendable Launch Vehicle (EELV) launches. We must maintain that perfect record: launch failures are too expensive, in money and lost capability. LET is our effort to make sure that success will continue, and it involves four major efforts: 1) transforming launch services acquisition, 2) upgrading range capability, 3) fully leveraging ARC and the ANG, and 4) improving business practices to better support commercial providers.

As part of the launch services acquisition effort, we continue to look for ways to make EELV more cost-effective by working with the NRO and NASA for block buy opportunities. To

help foster commercial participation at our launch ranges, we are also defining "new entrant" criteria as part of our overall approach to space launch. And we cannot neglect technology development; we are preparing a new reusable first stage demonstration and are pursuing technology for a new reusable rocket engine.

Launch and Range Enterprise services will also be affected by the decision to replace NASA's Constellation program with a new approach to space exploration that will likely result in increased use of the EELV. Our initial steps will ensure that the industrial base interdependencies between EELV and other launch systems are considered to support a viable national launch industrial base.

The effort to upgrade range capability has been long in coming; our range infrastructure has been increasingly unsustainable and, unless addressed, will impose costly delays on national security, civil, and commercial launches alike. Our national space launch and weapon system test and evaluation capabilities demand a flexible range architecture. To address these demands, we are divesting redundant instrumentation while modernizing and increasing the reliability and availability of essential range assets. In addition, our future range design incorporates a telemetry-based architecture with an integrated GPS metric tracking capability.

Positioning, Navigation and Timing (PNT)

The Global Positioning System (GPS) continues to provide highly accurate positioning and timing signals that enable highly precise Joint combat operations worldwide. GPS is also a free utility serving as an enabler for economic transactions and influencing the global economy by more than $110 billion annually. We at AFSPC, the Air Force, and the Department of Defense do recognize and embrace our special responsibility to maintain GPS as the "gold standard" for space-based PNT.

We continue to modernize the system and are developing and fielding a more robust, taskable, third-generation GPS satellite which will provide improved operational capabilities to military and civil users. In 2009, we launched the last two GPS Block IIR-M satellites, and for 2010 we continue preparations to launch, deploy, and operate the first GPS Block IIF satellites. For civil users, these new Block IIF satellites will broadcast the first operational signals in the L5 frequency band, which is protected by internationally recognized spectrum rules to ensure robust service quality for safety-of-life applications, such as aircraft all-weather approach and landing. In addition, we are building the first increment of eight GPS III satellites and a new Next Generation Control Segment (OCX). Together, GPS III and OCX will improve user collaboration, incorporate an effects-based approach to operations, and establish a net-centric architecture accelerating the mission application of positioning and timing information.

Recognizing the Joint team's constant demand for enhanced GPS capabilities in geographically challenging areas where terrain can degrade GPS signal coverage, we partnered with USSTRATCOM and developed a plan called "Expandable 24." This approach not only benefits military operations in places like Afghanistan, but all GPS users around the world, by taking advantage of the largest on-orbit GPS constellation in history. Over the next two years, we will gradually reposition GPS satellites to increase the number of satellites in view, thereby improving availability and accuracy worldwide.

We continue to develop Military GPS User Equipment (MGUE) to exploit the features of our new GPS satellites and control segment features. A key aspect of MGUE is the development of a common GPS module facilitating easy integration of GPS solutions into multiple platforms. Overall, our GPS enterprise efforts maintain the highest service performance levels to the civil

community while transforming and modernizing GPS into a robust, taskable system tailored to meet unique military needs in today's operational environments.

Satellite Communications (SATCOM)

The Joint Force Commanders rely on military and commercial SATCOM (especially in austere environments) to communicate securely and receive data, imagery, and full motion video from Remotely Piloted Aircraft. Those services will depend heavily on our Wideband Global SATCOM (WGS) system. Mission operations began last August with the second WGS (WGS-2) satellite, positioned over the Southwest Asia AOR, and it is now delivering ten times the capability that we had with the legacy Defense Satellite Communications System (DSCS). Last December we launched the third WGS (WGS-3) which is being positioned over the EUCOM and AFRICOM AORs.

The demand for wideband MILSATCOM capability never slows, and so we have requested $595 million to continue production of WGS-4, & 5 and procurement of WGS-7. Funded by our allied partner Australia, WGS-6 production continues on schedule. And later this year we expect to accept and launch the first Advanced Extremely High Frequency (AEHF) satellite, a new system that will increase the protected communications data rate more than five-fold and provide more coverage opportunities than Milstar. The end result will be enhanced national command and control satellite networks for the President, Secretary of Defense and Combatant Commanders. Meanwhile, we are evaluating the right strategies to evolve future MILSATCOM capabilities to support COCOM requirements.

Overhead Persistent Infrared (OPIR)

Only from space can we be assured of comprehensive missile warning and missile defense information. The first two Space Based Infrared System (SBIRS) Highly Elliptical Orbit-1 (HEO-1) and HEO-2 payloads provide our Nation with comprehensive missile warning and missile defense data. This critical information in the hands of warfighters, particularly in contested areas and where no other assets are available, is invaluable. Furthermore, Congress added $13.8 million in FY10 for exploitation initiatives providing Joint Force Commanders with advanced Battlespace Awareness and Technical Intelligence.

While the Joint Force Commanders benefit from the advanced SBIRS HEO detection and data exploitation efforts, we requested $530 million for the SBIRS Geosynchronous Earth Orbit (GEO) development program. As part of our OPIR portfolio, the SBIRS GEO payload will provide enhanced detection and data processing capabilities to the warfighter and the Intelligence Community. Recognizing a significant achievement, the first SBIRS GEO (GEO-1) space vehicle successfully completed Thermal Vacuum (TVAC) testing and is undergoing subsequent flight hardware replacement and software qualification. We look forward to final launch readiness and delivery to meet GEO-1 launch in 2011.

Space Control

As we enter the 19th year of continuous combat operations in the Persian Gulf, AFSPC continues to provide sustained defensive counterspace capability to USCENTCOM. We are in our sixth year of continuous presence in theater with SILENT SENTRY which provides critical electromagnetic interference detection and geolocation tools and highlights the need for a global capability.

As part of evolving our support to the Joint fight, we are developing and fielding a follow-on system, RAIDRS Block 10 (RB-10). RB-10 is integrated as part of JMS and will provide transportable ground systems located around the world. In addition, the RB-10 capability will route SATCOM interference detection and geolocation data to the JSpOC thereby helping us protect military communication channels.

Operationally Responsive Space (ORS)

The ORS program is exploring ways in which the urgent needs of Joint Force Commanders might usefully be addressed, and AFSPC works with the ORS office on projects involving communications, SSA, surveillance and reconnaissance. For example, TacSat-3 was launched on 19 May 2009, as an experimental system designed to demonstrate the military utility of a small satellite, taskable by a tactical user in the field to search and collect specific hyper spectral images and downlink the results directly to deployed ground units. We are assessing the utility of transitioning TacSat-3 to a residual DoD-operated reconnaissance system upon completion of its experimental period in May 2010.

Later this year another ORS satellite, the ORS-1, should begin providing multi-spectral imagery of regions selected by ground force commanders. Existing ground systems will process and distribute the resulting images, and this development should also help inform a multi-mission modular approach that might prove useful in the future.

Space Weather - National Polar-orbiting Operational Environmental Satellite System (NPOESS)

On 1 February 2010, the Executive Office of the President directed a major restructuring of the NPOESS program, whereby procurement of the system will no longer be joint. NOAA and NASA will take primary responsibility for the afternoon orbit, and the Air Force will take

primary responsibility for the morning orbit. As we work through this transition, we will continue to foster our longstanding productive partnerships with NOAA and NASA, by sharing data, coordinating user needs and operating satellites.

AFSPC Goal: Forge a Battle-Ready Team by Attracting, Developing and Retaining America's Best

AFSPC will continue to be a leader in attracting, developing and retaining Airmen and civilians with the professional skills needed to succeed. Recognizing the critical roles of our families, we continue to extend the wingman culture to help nurture success on the home front. During 2010-2011, we will improve training and professional development programs; refine career paths and take necessary steps to care for our Airmen and their families.

Developing Airmen

Over the past year, we integrated space education and training into mainstream Air Force processes to enhance professional development and ensure continued sustainment. This construct equips our space professionals with a sound foundation at Undergraduate and Initial Qualification Training, expands their operational and strategic perspective of space through Space 200 and 300 continuing education and adds tailored advanced operational training at subsequent career milestones. Our programs have now developed over 13,000 space professionals who are experienced in today's real-world and combat operations.

Since my last appearance before your subcommittee, we worked with Air Education and Training Command (AETC) to restructure the National Security Space Institute (NSSI). In essence we created two complementary space academic organizations. The new NSSI is focused on "graduate level" continuing education and is now aligned under Air University, charged with specific responsibility for Air Force-wide Professional Continuing Education (PCE). Advanced

operational system training, fundamentals courses and pre-deployment training are now provided by the Advanced Space Operations School (ASOpS) which is directly associated with the Air Force Warfare Center. Together the NSSI and ASOpS are the premier focal points for advanced space education and training, providing instruction to 1,728 students in 2009 including students from the Air Force, Army, Navy, Marine Corps, civil service, and allied partners. This year, we will begin construction on a $19.9 million facility housing both schools on Peterson AFB CO.

We are carefully crafting a similar force development approach for our cyberspace professionals. Equipped with the vision outlined in "The Air Force Roadmap for the Development of Cyberspace Professionals," and the experience gained by our Space Professional Development Program, we are building a parallel career development model for cyberspace. The goal is to ensure that cyberspace professionals have the proper academic credentials, the right training and education and requisite experience to establish, protect and leverage this critical domain. This year AETC will open the doors to Undergraduate Cyber Training (UCT) courses for the newly established Cyberspace Operations officer specialty and the Cyberspace Defense Operations and Cyberspace Support enlisted specialties.

Missions conducted in and through the cyberspace domain will require Airmen with specific technical education and network-savvy aptitude. Working with academia and industry partners, we have defined academic prerequisites for cyberspace accessions, and are addressing the challenge in identifying and recruiting such people. To do this right, we need effective, innovative recruiting strategies and meaningful incentives to attract and retain cyberspace professionals.

In addition to UCT, we are working with Air University and the Air Force Cyberspace Technical Center of Excellence to establish Cyber 200 and 300 courses along with advanced

operations courses for cyberspace professionals. Course curricula are under development and we expect to teach classes on an interim basis in October 2010 with a permanent approach in place in FY12.

Families and Quality of Life

The year 2010 is the "Year of the Air Force Family." In AFSPC, we recognize the sacrifices and contributions of our families by extending our wingman culture and emphasizing suicide prevention, safety, and family support. In addition, we are working to attract and retain our Airmen and their families by providing quality housing and enhancing the sense of community on our installations.

AFSPC significantly improved mission capabilities and the quality of life for its Airmen and their families in 2009 by investing $453 million on over 700 projects to sustain and modernize facilities, infrastructure and housing. We also executed $149 million of American Recovery and Reinvestment Act funds on another 280 projects to improve our working, living, and recreational environments. The combined $602 million was invested in areas to include housing, dormitories, a new child development center, fitness centers, community activity centers, launch, and nuclear mission facilities; and electrical, heating/air conditioning, water and road infrastructure. For 2010, we will invest $118 million in MILCON projects for a child development center, facilities construction, and key projects across AFSPC.

AFSPC Goal: Modernize and Sustain AFSPC's Enduring Missions and Mature Emerging Missions

As the Air Force lead for cyberspace, AFSPC will provide cyberspace capabilities that, when integrated with air and space capabilities, enable combat effects in a new way. As we have done with our space capabilities, we will establish a path to grow cyberspace operations,

education, training, and development. We will also identify specific areas to draw on the combined resources of the ANG, ARC, and government civilians. Our plan is laid out in the "The United States Air Force Blueprint for Cyberspace," which we will use in working closely with our Joint fight partners to provide complementary capabilities. The blueprint describes how we will align cyberspace activities and functions, evolve and integrate these unique capabilities, and build operational capacity. We must ensure that we can both defend against attacks and "fight through" and respond to attacks, in order to assure mission accomplishment.

The newly activated 24th Air Force serves as the Air Force's operational cyberspace component to USSTRATCOM and is charged to integrate, employ, and present Air Force cyberspace capabilities. Structured pursuant to direction from the Secretary of the Air Force and Air Force Chief of Staff, the 24th Air Force achieved Initial Operational Capability (IOC) on 22 January 2010.

Total Force

In 2009, AFSPC continued to leverage ARC support to AFSPC missions. Our Total Force Integration (TFI) Strategy capitalizes on existing ARC presence and inherent strengths of the Reserve and Guard components. As we stood up 24th Air Force, our TFI partnerships played a key role in our success. Across AFSPC, our ARC partnerships in satellite and launch range operations, SSA, and battlespace awareness provide critical continuity and surge capacity. We are also preparing to increase ARC presence in missile warning, space control and cyberspace operations.

Schriever Wargame Series

The recurring Schriever Wargame Series has proven insightful in identifying key strategic and policy issues. At the end of our fifth Schriever Wargame in March 2009, we

addressed key issues involving space deterrence, capability employment, and policy implementation and planning with senior leaders throughout the national security community. This wargame identified areas requiring additional emphasis, highlighted the close relationships between space and cyberspace capabilities, and informed our strategic development efforts in both the QDR and SPR. We are now preparing for this year's wargame and look forward to increased international and industry participation.

AFSPC Goal: Reengineer Acquisition to Deliver Capability at the Speed of Need

No one doubts that we need to push relentlessly to improve acquisition. Our vision is to provide what Joint Force Commanders need, when they need it—capability at the speed of need. We have far to go, but recent successes show that we are on the right track. As mentioned earlier, in the past year we increased on-orbit capability with GPS IIR-20M & 21M, DMSP-18, WGS-2, and WGS-3. We are on track to deliver new capabilities as we have completed a GPS III Preliminary Design Review as well as GEO-1 and AEHF SV-1 TVAC testing.

We will continue to pursue our "back to basics" philosophy and block-build approach, fund to the most probable cost, increase our acquisition workforce and expertise, improve relations with industry, and implement strict requirements control. Our Space and Missile Systems Center will deliver five major systems in the next twenty-four months for SBIRS, AEHF, GPS IIF, ORS-1, and SBSS. The GPS III, OCX and Space Fence development programs are on the right track.

As we reengineer acquisition processes, we are focusing efforts to rebuild the acquisition workforce and strengthen relationships across Industry and DoD. In an effort to recapture acquisition excellence, the USAF implemented an Acquisition Improvement Plan (AIP) to revitalize the acquisition workforce; improve requirements generation processes; instill budget

and financial discipline; improve major systems source selections; and establish clear lines of authority and accountability within organizations. Overall, the AIP increases accountability at higher leadership levels, increases communication between MAJCOMs and between product centers and MAJCOMs.

Furthermore, we implemented a Human Capital Strategic Plan to recruit, develop, and retain acquisition expertise. As part of the recruitment effort, we are developing and marketing a recruitment strategy that targets individuals with the desired education, experience, and skill sets. Taking advantage of favorable job market conditions and expedited hiring authorities, we hired over 300 recent college graduates. The Air Force Space Command actions described above are consistent with 2009 Weapon Systems Acquisition Reform Act (WSARA) implementation and DoD's Acquisition Reform and Hiring Process goals.

Conclusion

Space and cyberspace capabilities allow warfighting commands to meet the challenge of protecting the American people, their livelihoods and interests with precision at the moment of need. At AFSPC, our vision, our mission, our job, and our dedication is to make sure those commanders have the very best capabilities that we can provide. With the continued support of the Congress, we will be able to assure that our country will have the space and cyberspace forces it needs tomorrow and in years to come.

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THE HOUSE ARMED SERVICES COMMITTEE
STRATEGIC FORCES SUBCOMMITTEE

STATEMENT OF

MR. ROBERT BUTLER
DEPUTY ASSISTANT SECRETARY OF DEFENSE
FOR CYBER AND SPACE POLICY

BEFORE THE

HOUSE ARMED SERVICES COMMITTEE
SUBCOMMITTEE ON STRATEGIC FORCES

APRIL 21, 2010

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THE HOUSE ARMED SERVICES COMMITTEE
STRATEGIC FORCES SUBCOMMITTEE

Mr. Chairman and members of the sub-committee, thank you for the opportunity to testify on Department of Defense space policy. I am honored to join my distinguished colleagues from the Department of the Air Force, Air Force Space Command and the National Reconnaissance Office.

Our space assets grant us myriad national security advantages. Among other benefits, they allow us to strike with precision, navigate with accuracy, communicate with certainty, and see the battlefield with clarity. Space capabilities are key to prevailing in today's conflicts.

From the warfighter's perspective, space capabilities have evolved from unique "one-of-a-kind" systems, to "nice to have" in the fight, to their current status as "must-have" capacities. And this evolution has occurred in a relatively short timeframe. Our battlefields have changed dramatically as a result: commanders on the ground, in remote theaters such as Afghanistan, can receive actionable intelligence in minutes, rather than hours due to investments in space-based intelligence, surveillance and reconnaissance. Similarly, our approach to strategic planning has changed by virtue of our reliable access to space and the capabilities it affords. This access is a potential source of strategic stability, improving decision-makers' timely insight into developments around the world that have an impact on U.S. interests.

The Administration delivered to Congress a Space Posture Review *(interim report)* on March 15th, 2010. This report highlighted the space environment in which the U.S. finds itself, and the three broad characteristics which best describe that environment today: congested, competitive, and contested.

Space is *congested*. There are over 21,000 objects in the current space catalog and over 1100 active systems on orbit. Our own space ventures have created some space debris, and as more countries enter the space domain with on-orbit assets, increasing space debris could jeopardize the long-term sustainability of key orbital "belts." The 2007 Chinese ASAT test alone created over 2,750 pieces of "trackable" space debris. In February 2009, Iridium 33 (a commercial satellite) and COSMOS 2251 (a non-functioning Russian communications satellite) collided in low Earth orbit. This collision created another 500 pieces of debris in low Earth orbit. The U.S. Space Shuttle and the International Space Station have maneuvered to avoid this dangerous

debris. At speeds greater than 17,000 miles per hour, a seemingly harmless paint chip from a rocket body becomes a potentially devastating obstacle. This is particularly unnerving given the risk to manned space flight presented by a potential debris collision with the U.S. Space Shuttle and the International Space Station, or with another country's manned space missions. Unmanned national security systems, which cannot be refueled, have had to expend fuel on unplanned maneuvers to avoid collisions with space debris. Another impact of the debris problem on U.S. space operations is that the growing inventory requires an increasing commitment of resources to catalogue, track report and "manage" – indeed, one might say that "debris management" has now become a critical element of day-to-day U.S. space operations.

Space is also increasingly *competitive*. Today, more than 60 nations or commercial entities have satellites in space. European nations and consortia have emerged as leading global players in the development of space technologies and applications that support civil, commercial, intelligence, and military use—indeed, many of these efforts are undertaken with dual-use space capabilities specifically in mind. Among them, Russia has maintained the largest infrastructure to support space operations. Many foreign countries which have a different approach to controls of dual-use technologies than the United States are increasing their presence in the international market with satellites, sub-components, and launch activities. As a space technology leader, the United States must balance carefully national security oversight of its space-related exports with the long-term health and international competitiveness of our domestic space industrial base

Finally, space is *contested*. China is far from the only actor seeking to develop the capability to deny or interfere with the space capabilities of others. In 2003, Iran jammed broadcasts of the Telstar-12 commercial satellite, and Iraq jammed GPS signals during Operation IRAQI FREEDOM. Libya reportedly jammed Telstar-12 in 2005. As recently as March 20, 2010, Iran was jamming commercial satellites to block international television news broadcasts to their public, and other countries have conducted similar efforts. U.S. and allied space assets today are threatened by both reversible and non-reversible capabilities. Some of these are physically destructive "kinetic" options, while others involve use of the radio frequency spectrum to jam communications links. Taken together, these capabilities represent tools that competitors and adversaries can use readily to deny the U.S. and allied countries reliable access to space during a crisis or conflict.

Leveraging the opportunities of this strategic environment, while addressing its challenges, requires significant investment, oversight and management. We divide space into a variety of mission areas, all of which are interdependent:

- Space Command and Control (Space C2)
- Space Situational Awareness (SSA)
- Space Control
- Satellite Operations (SATOPS)
- Spacelift Operations
- Positioning, Navigation and Timing (PNT)
- Satellite Communications (SATCOM)
- Environmental Monitoring
- Integrated Tactical Warning/Attack Assessment (ITW/AA)
- Space-based Intelligence Surveillance and Reconnaissance (ISR)

In an increasingly congested, competitive, and contested space domain, the Department of Defense must continue to provide the required services across the aforementioned mission areas despite the level of conflict and plan and program for capabilities that take into account the projected space environment. Adding to this dynamic context, the Department must continue to reap asymmetric benefits from the space domain in a cost-constrained fiscal environment. As part of the ongoing Space Posture Review, we will examine the implications of a new strategic approach on these mission areas.

Today, however, I would like to focus my remarks on Space Situational Awareness (SSA), international engagement, and the importance of the commercial sector for space.

The President directed the Secretary of Defense provide Space Situational Awareness (SSA) for the U.S. government and, as appropriate, to commercial and foreign entities. The 2010 National Defense Authorization Act provided authority for the Secretary to provide SSA services to commercial and foreign entities, and to accept such information from those entities. In December 2009, the Secretary directed United States Strategic Command to take the lead for this important expansion of the SSA mission, indicating the growing importance of the SSA mission, for the U.S. and its space-faring partners, and to better align missions under USSTRATCOM.

The Department continues to invest in maintaining and modernizing the U.S. SSA architecture to prepare for continued increases in spaceflight by international players, and to ensure that the benefits of space operations for the U.S. continue into the future. SSA is not solely a U.S. interest. Far from it. We are committed to maintaining a sustainable space environment for space operations for all nations, even as we both protect U.S. and allied interests and deter aggression in space. While maintaining a viable domain for space operations and protecting U.S. interests in space are of the utmost importance, so too is diminishing U.S. vulnerabilities in space. Continued U.S. leadership is required to enable safe spaceflight operations. Such leadership, in turn, is essential to fostering responsible behavior and use of the space domain.

The February 2009 collision highlights the need to improve shared space situational awareness. As part of an effort to prevent future collisions, the United States has improved its capacity to track objects in space as well as its capability to predict potential close satellite approaches that might pose a hazard to active spacecraft. I am pleased to report that as of December 2009, the Joint Space Operations Center at Vandenberg Air Force Base, California, routinely screens all active satellites against every object in the satellite catalogue to identify close approaches. The United States also provides notification to other government and commercial satellite operators when U.S. space analysts assess that an operator's satellite is predicted to pass within a close distance of another spacecraft or space debris.

In addition to improved SSA, DoD is also addressing what would happen to our operations in a degraded space environment. Numerous war games, such as Schriever-series, as well as subsequent analyses, have shown us that testing ourselves in a framework of diminished access to space may be an important part of our strategy development. Each of the Services conducted a "day without space" study to determine the impacts of losing critical space capabilities; the results were stark. The United States is so heavily reliant on space capabilities, for both wartime prosecution and day-to-day operations, that to lose those capabilities would hamper severely our ability to pursue national security interests. This is exactly why we must scope our approach to address the ability to succeed in a degraded space environment. We must be cautious in other ways as well.

Our inventory of space assets must collectively include responsive and resilient capabilities. The United States must protect existing systems through tactics that limit their vulnerability but also

include redundancies that make our systems more resilient. We must also be prepared to rapidly augment our capabilities or to reconstitute them in the event of catastrophic loss or attacks.

Replacement satellites, unmanned platforms, and other cross-domain (air, land, sea, and cyber) solutions, can temporarily mitigate the loss of some space assets. In this context, our Operational Responsive Space (ORS) program can help us counter some threats to our space capabilities – and supplement yet others. The first ORS satellite will support operations in theaters of active conflict. DoD is on track to meet our goal of going from program start to launch soon in 24 months.

Growing international and commercial interest and expertise in space presents opportunities for the United States. The long history of international cooperation in civil space programs and U.S. government partnerships with commercial space service providers can serve as a foundation for collaborative global action to shape the future space environment. In coordination with the Department of State and other U.S. departments and agencies, DoD has the opportunity to build on existing international and commercial relationships, as well as develop new partnerships, to enable positive changes to the space posture of the United States. Greater global investment in space can also help strengthen the U.S. space industrial base by providing more market opportunities to U.S. suppliers and service providers.

Current international cooperation includes a variety of military-to-military agreements, as well as specific operational relationships. Bilateral defense space cooperation forums with key allies and partners can explore opportunities for mutually-beneficial cooperative activities and facilitate the coordination and implementation of defense space policies, architectures, activities and programs. These forums can lead to specific bilateral agreements with other nations or international consortia for cooperative activities such as data exchange and system sharing.

Additionally, the United States is expanding its current data sharing and space situational awareness services to the broader international space-faring community in order to support spaceflight safety worldwide. DoD has a number of partnership agreements to conduct space operations and we are rapidly building on and expanding those relationships. These agreements

include shared operations and maintenance of surveillance sites and satellite operations. The Department also conducts space operations in a variety of world-wide locations with the help of our allies and partners. DoD also exchanges space operations personnel with a number of our allies and partners.

These activities are opportunities to deepen international relationships with existing space allies and make inroads with the growing number of nations fielding, or seeking to field, their own space capabilities. As the number of nations with space capabilities increases, so too will the opportunities for increased sharing. For nations with existing capabilities, there exist opportunities for mutually-beneficial partnerships to exchange current and planned data and capabilities. For nations without space capabilities there exist opportunities for the United States to assist those nations in developing capabilities that are compatible with U.S. programs and capabilities to enable future cooperation. Greater international interest and expertise in space ultimately broadens and deepens the pool of potential partners and enables a more collaborative approach to future activities in space. Any cooperative agreements, however, should protect sensitive U.S. national security capabilities and technologies, and be consistent with broad foreign policy and national security interests.

Current national security use of commercial space services is focused in two areas – satellite communications and remote sensing. Forces deployed to theaters without reliable terrestrial communications infrastructure depend on satellites to meet much of their communications needs.

Though there are government capabilities to support users, demand in some theaters far outstrips supply. Commercial wideband satellite communications services help meet that demand, in most theaters carrying far more communications than government systems. Remote sensing firms provide a complementary capability to national imagery systems. Though commercial systems do not provide the resolution, volume, or timeliness of national systems, they can meet selective national security requirements. The United States has the opportunity to strengthen partnerships with existing commercial service providers and encourage the development of new commercial space capabilities. Because some existing commercial capabilities were initially procured to meet unanticipated needs, some commercial firms have not been approached strategically. For

example, in some mission areas, the government has negotiated long-term rates for space services, but in others, services are purchased at spot market prices. Addressing the shortcomings of these relationships with commercial service providers can enhance U.S. capabilities, strengthen partnerships with private industry and stabilize cost profiles over the long term. Encouraging additional commercial endeavors in other mission areas could expand the range of available commercial capabilities available to the DoD, IC and other national space activities.

Conclusion

In the end, there is no simple solution to a space environment that is congested, competitive, and contested. Instead, we require a strategy that encompasses a broad range of responses. As the space domain rapidly evolves, we face both risks that threaten to erode our current substantial advantage in space and opportunities to strengthen our security. The challenges related to access to, and use of, space are among the most pressing and difficult the Department of Defense is addressing today. With the continuing support of the Congress, the Department is committed to continuing to strengthen the strategic posture of the United States with improved capabilities, and appropriate interagency, international, and private sector partnerships. In the near future the Defense Department and the Office of the Director of National Intelligence (ODNI), in full consultation with other departments and agencies of the Executive Branch, will develop a National Security Space Strategy. This effort will help us better align the ends, ways, and means to succeed in a congested, competitive, and contested space environment.

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

Statement for the Record

Ms. Betty Sapp

Principal Deputy Director, National Reconnaissance Office

Before the House Armed Services Committee

Subcommittee on Strategic Forces

21 April 2010

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INTRODUCTION

Chairman Langevin, Ranking Member Turner, and distinguished Members of the Committee, I am pleased to appear before you today to discuss the National Reconnaissance Office (NRO) fiscal year (FY) 2011 program and national security space activities. It is an honor for me to appear alongside our mission partners from the Department of Defense (DoD), the Honorable Robert Butler, Deputy Assistant Secretary of Defense for Cyber and Space Policy; the Honorable Gary Payton, Deputy Under Secretary of the Air Force for Space Programs; and General Robert Kehler, Commander, Air Force Space Command. The NRO's close relationship and continuing partnership with our mission partners are vital to maintaining our Nation's superiority in space.

The unclassified nature of today's hearing precludes me from discussing many details of NRO programs, as well as sharing some of our greatest successes. However, I welcome the opportunity to meet in another setting to fully discuss with you the breadth and depth of NRO capabilities, partnerships, and value of the NRO contributions to our national security.

State of the NRO. On behalf of General Bruce Carlson (USAF, Ret.), the Director, NRO (DNRO), I would like to begin with a few words about the state of the NRO today. First and foremost, the unique composition of our workforce is one of our

greatest strengths. As you know, we draw our personnel from across the DoD and Intelligence Community (IC), allowing us unique access to the "best and brightest" from across the space acquisition community and to all the acquisition "lessons learned." The talented people of the NRO allow our significant and continued mission success, and enable our ability to provide the very best information to the warfighter.

From launching the most technically-capable systems, to continued operations of legacy satellites, to business practices, the NRO remains the premier space reconnaissance organization in the world. Like any organization that operates in the unforgiving binary environment of total success versus failure with little middle ground, the NRO continuously strives to improve and learn from both our successes and our setbacks. We have had significant successes in the last year. We plan to extend that record of success through the next twelve months, and through multiple launches. In this regard, the NRO is wholly-focused on continuing our high performance by delivering these upcoming satellites on time and on budget. General Carlson and I are both confident that by continuing to leverage past successes and community workforce strengths, the NRO will continue to provide the Nation with the space reconnaissance capabilities it requires.

DNRO Priorities. Since taking the helm at the NRO last summer, General Carlson has communicated his priorities for the NRO in a very straight-forward manner. It is a priority of the NRO to execute programs on time and on budget. It is a priority of the NRO to improve our research and technology (R&T) investment. And it is a priority of the NRO to continue to invest in the foundation of our organization---to recruit, train, and retain the best people.

And as many of you already know, General Carlson is focused on completing the work required to revise the outdated NRO Charter. Just last month, the Director of National Intelligence (DNI) and the Secretary of Defense endorsed the *Organizing Principles for the National Reconnaissance Office* and recommended this document serve as the foundation for revising the 1965 NRO Charter. This is a significant step forward in the revision process.

NRO CONTRIBUTIONS: CRITICAL TO THE FIGHT

I would like to briefly discuss a critical mission for the NRO---support to the warfighter. Almost nine years after the attacks of September 11th, NRO systems and people continue to make significant contributions each and every day to ongoing operations around the globe. The NRO currently has over 40 personnel deployed in harm's way in direct support of the

warfighter, and we continue to rapidly adapt to the needs and changing pace of our deployed forces.

For example, in concert with our mission partners, the NRO and its systems recently provided significant support to the 101st Airborne Aviation Brigade during the initial weeks of its redeployment to Afghanistan. Only last month, a helicopter from the Screaming Eagles went down in a remote location near a Forward Operating Base (FOB) in Zabul Province. With no available organic ISR assets due to the FOB's remote location, weather, and other tasking priorities, the Brigade's intelligence staff requested immediate imagery assistance from a combined NRO/National Geospatial Intelligence Agency (NGA) cell. We were able to rapidly provide multiple images of the area on a very low bandwidth connection, which enabled the Brigade to quickly assess the situation and secure a new perimeter around the crash site. Key imagery intelligence was provided to the operations and rescue teams within minutes, with the end result being the safe rescue of 14 wounded soldiers and the crash site secured and protected. One of the intelligence officers from the Brigade relayed to our people the following after this mission: "I wanted to pass on my sincere thanks for your support that night. An aircraft down is one of the worst things we can experience as a unit and your timely imagery support was pivotal to our rescue teams."

The NRO also continues to focus on expanding access to NRO products and services, improving the content of the NRO informational products, and reducing the amount of time it takes to get relevant data to the warfighter. Led by the NRO's Mission Support Directorate, the NRO is concentrating on developing new capabilities for warfighters, operators, and intelligence analysts. We are focused on support to Counter-Improvised Explosive Device (C-IED) efforts, Counter-Unmanned Aerial System (C-UAS) efforts, and communications infrastructure and technology solutions designed to support "find, fix, and finish" operations. A prime example of this is an NRO project known as "RED DOT", which went operational in Iraq last month after it was rapidly developed, tested, and fielded in just over a year. RED DOT leverages reduced processing timelines that the NRO has been aggressively pursuing, and more efficiently moves time-sensitive intelligence data to the warfighter, by semi-automatically passing indications and warnings data from national systems down to tactical vehicles at the unclassified level. This results in increased force protection and serves as a pathfinder for delivering other national systems data down to the soldier in harm's way.

In addition to rapidly developing and deploying capabilities in support of the warfighter, the NRO is also proactively involved with pre-deployment training and education

initiatives throughout DoD and the IC. NRO personnel instruct our system capabilities as part of the core curriculum at the Army's Intelligence Center of Excellence at Fort Huachuca, Arizona; and our Mobile Training Teams have provided both the Army's I Corps and III Corps with relevant training on national intelligence capabilities available to the unit in theater. And of particular note, our School of Warfighter Support, one of the schools within the NRO University structure, recently was awarded the DNI 2009 Excellence in Intelligence Community Education and Training Award.

SPACE INDUSTRIAL BASE

Maintaining a healthy space industrial base is a matter of critical importance to our national security. In the history of the space age we have rarely been so reliant on so few space industry suppliers. Many suppliers are struggling to remain competitive as demand for highly specialized space components dwindles due to a niche government customer-base. We must all do our part to improve this situation for the long-term. The NRO is dedicated to improving the health of the industrial base through well-defined requirements that are coupled with good government oversight and stable budgets and production line rates.

Additionally, as you know, the landscape of the launch capability changed significantly in December 2006 when the United Launch Alliance (ULA) was established. The NRO works with the Air Force to ensure EELV availability and sustainability.

CONCLUSION

I would like to conclude my remarks today by highlighting an example of NRO's excellence and teamwork. In November 2009, the NRO received an Unqualified Opinion on the fiscal year 2009 Financial Statement. This was the first clean audit for a defense intelligence agency since 2003. This positive outcome was the result of hard work across the NRO workforce and the culmination of a diligently planned and executed two-year effort to achieve a clean opinion. NRO's internal processes for proper funds management and accurate financial reports have now been validated, and we are effectively positioned to sustain this Unqualified Opinion into the future.

The NRO vision is "vigilance from above" for our Nation. We remain focused on providing innovative overhead intelligence systems for national security, and the people of the NRO embody our core values of integrity and accountability, teamwork built on respect and diversity, and mission excellence. Driven by our extraordinary people, the NRO will continue on the path of

delivering acquisition and operations excellence, as well as the unparalleled innovation that is the hallmark of our history and foundation of our future.

Mr. Chairman and members of the Committee, thank you for the opportunity to appear before you today. On behalf of General Carlson, I thank you for your continued support of the NRO, and I stand ready to answer your questions.

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HOUSE ARMED SERVICES COMMITTEE
STRATEGIC FORCES SUBCOMMITTEE
UNITED STATES HOUSE OF REPRESENTATIVES

DEPARTMENT OF THE AIR FORCE

PRESENTATION TO THE HOUSE ARMED SERVICES COMMITTEE
STRATEGIC FORCES SUBCOMMITTEE
UNITED STATES HOUSE OF REPRESENTATIVES

ON

APRIL 21, 2010

SUBJECT: Military Space Programs in Review of the Defense Authorization Request for Fiscal Year 2011 and the Future Years Defense Program.

STATEMENT OF: Mr. Gary E. Payton
Deputy Under Secretary of the Air Force for Space Programs

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HOUSE ARMED SERVICES COMMITTEE
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INTRODUCTION

Chairman Langevin, Representative Turner, and distinguished members of the Committee, it is an honor to appear before this Committee as the Deputy Under Secretary of the Air Force for Space Programs, and to discuss our military space activities. I support the Secretary of the Air Force with his responsibilities as the Service Acquisition Executive for Space Programs.

I believe the overall soundness of our Air Force space program is best illustrated by our consecutive string of 64 successful national security space launches over the past 10 years, most recently demonstrated with the December 2009 launch of the third Wideband Global Satellite Communications (SATCOM) satellite aboard a Delta IV launch vehicle. This record is the result of a world-class team of space professionals across our government and industry, all dedicated to the single purpose of providing essential capabilities to our joint warfighters and allies around the world. With superior space systems we provide our leadership with intelligence and situational awareness that otherwise would be impossible to collect. Space enables us to employ military force in both irregular warfare and conventional situations – we see the battlefield more clearly and destroy targets with greater precision. While acknowledging the ever increasing advantages that these space capabilities provide, we acknowledge that many of the satellites and associated infrastructure have outlived their intended design lives.

To ensure the availability of these systems, the military space portion of the President's FY2011 budget submission is focused on the continuity of key mission areas including worldwide communication; global positioning, navigation and timing; global missile warning; weather; and launch. Simultaneously, we are enhancing the protection of our space capabilities

through improved Space Situational Awareness (SSA), defensive counterspace, and reconstitution efforts. This calendar year we will bear the fruit of investments from previous years with the planned launches of four "first of" operational satellites. The four "first of" satellites are the Advanced Extremely High Frequency (AEHF) protected communications satellite, Space Based Space Surveillance (SBSS) satellite, Global Positioning System (GPS) II-F satellite, and Operationally Responsive Space (ORS) 1 satellite.

Worldwide communication is enabled through a ubiquitous space-based system with government and commercial platforms. Our users stretch from the Oval Office to the mountains of Afghanistan. Using protected, wideband, or narrowband communications, the President can command the nation's nuclear forces, our UAV pilots can fly Predators over Iraq and Afghanistan from the United States, and Special Forces teams can call for exfiltration or tactical air support.

Global positioning, navigation and timing is a free worldwide service. It provides position accuracy down to the centimeter and time accuracy to the nanosecond over the entire planet, 24-hours a day, 7-days a week, and in any weather. The Department of Defense and the Intelligence Community depend on our Global Positioning System (GPS) to support a myriad of missions and capabilities including weapon system guidance, precise navigation, satellite positioning, and communication network timing. The civil and commercial communities are equally reliant on GPS as the underpinning for a vast infrastructure of services and products including search and rescue, banking, map surveying, farming, and even sports and leisure activities.

Global missile warning through Overhead Persistent Infra-Red (OPIR) sensors is our unblinking eye ensuring that we know whenever a rocket launches from anywhere on Earth.

Our missile warning system is fast, persistent, and accurate in determining missile launch directions. At the strategic level, it informs leadership as they determine courses of action to defend America and our allies, and at the tactical level our real-time warning provides theater commanders with superior battlespace awareness.

Weather observation and forecasting has greatly improved over the last four decades primarily due to space-based environmental sensing. Global, high resolution measurements of atmospheric temperature, density, and humidity populate mathematic models for weather prediction. Our warfighters need accurate, time-sensitive weather data as a key enabler for maneuver planning, weapons employment, and intelligence collection.

Our on-orbit assets continue to face greater threats that could deny, damage, or destroy our access to space capabilities. We must anticipate potential disruptions, either accidental or intentional, to our space operations or risk losing continuity of service. As such, we are expanding our ability to detect, identify, characterize, and attribute threats, as well as clearly discriminate between a hostile act and one that occurs naturally. In parallel, we are developing the organizational, operational, and technical enablers, including command and control systems, which will allow us to react swiftly and decisively when threats materialize.

Congress' support has been a vital component in improving our acquisition of space systems, maintaining continuity of service, and charting a course for the next generation of space capabilities that will enhance American security, freedom, and prosperity.

UPDATE ON SPACE PROGRAMS

I would like to briefly discuss some of the achievements we have had over the last year and the progress we are making with regard to the mission areas I described earlier.

MISSILE WARNING

For over 35 years, our legacy Defense Support Program (DSP) satellites, in conjunction with ground based radars, have unfailingly met the nation's missile warning needs. This legacy constellation, however, continues to age, while threats such as the proliferation of theater ballistic missiles and advanced technologies continue to grow. These threats are driving the need for increased coverage and resolution provided by the Space Based Infrared System (SBIRS).

SBIRS supports four mission areas: missile warning, missile defense, technical intelligence, and battlespace awareness, and is comprised of both geosynchronous earth orbit (GEO) satellites and highly elliptical orbit (HEO) payloads. Two HEO payloads are fully operational and, along with the DSP constellation, continue to perform the missile warning mission while providing increased support to the other three mission areas. Completion of the first SBIRS GEO satellite is planned for the spring of 2011.

Our FY2011 funding request continues development and procurement of the GEO satellites, HEO payloads, and the necessary ground elements. This budget requests full procurement for a fourth GEO satellite, and contains future year requests for procurement of the fifth and sixth GEO satellites. The first GEO satellite completed environmental testing, and we continue to work the final qualification of flight software prior to a final integration test and delivery by the end of this year. Our budget request also continues the commercially hosted on-orbit Wide Field-of-View (WFOV) technology demonstration effort. By partnering with the commercial space industry, we will have the opportunity to conduct an early on-orbit scientific experiment of WFOV infrared data phenomenology using a Commercially Hosted IR Payload.

COMMUNICATIONS

The United States military is a highly mobile and dispersed force that relies heavily on wideband, protected, and narrowband satellite communications (SATCOM) for command, control, and coordination of forces. SATCOM enables forces to receive real-time images and video of the battlefield, thereby accelerating decision-making from the strategic to the tactical levels. These images and video often come from Unmanned Aerial Vehicles (UAVs) controlled via SATCOM links, allowing the UAVs to fly far beyond the line of sight and to collect information without endangering U.S. forces.

On December 5, 2009 we successfully launched the third Wideband Global SATCOM (WGS) satellite as part of the Department's constellation of wideband satellites providing increased capability for effective command and control of U.S. forces around the globe. Each individual WGS satellite provides greater wideband capacity than the entire legacy Defense Satellite Communications System (DSCS) III constellation. Our funding request continues on-orbit support for WGS 1-3, continues production of WGS 4-6, contains full procurement for WGS 7, and advance procurement for WGS 8.

In the protected SATCOM portfolio, we are conducting final confidence testing of the first Advanced Extremely High Frequency (AEHF) satellite with a projected launch in the third quarter of 2010. This initial AEHF launch will complete the worldwide Medium Data Rate (MDR) ring, increasing the data-rate for low probability of intercept/detection and anti-jam communications from tens-of-kilobytes per second to approximately a megabyte per second. Our funding request supports the launch and on-orbit support of AEHF 1; assembly, integration, and test of AEHF 2-3 and the AEHF Mission Control Segment; and the production of AEHF 4.

This budget requests advance procurement for AEHF 5, and contains a future year request for procurement of AEHF 6.

While near term satellite communication needs will be met with a combination of military systems (WGS and AEHF) and leased commercial SATCOM, the Air Force continues to work closely with the other Services, the Office of the Secretary of Defense, Joint Staff, and the Combatant Commands to meet the Department of Defense's future protected and wideband communication needs. To this end, the Air Force will investigate options to harvest technologies matured by previous Transformational Satellite Communications System (TSAT) efforts, and evolve the next generation MILSATCOM architecture to provide connectivity across the spectrum of missions, to include land, air and naval warfare; special operations; strategic nuclear operations; strategic defense; homeland security; theater operations; and space operations and intelligence.

POSITIONING, NAVIGATION AND TIMING

The United States Global Positioning System (GPS) continues to be the world standard for positioning, navigation, and timing (PNT). As a result, GPS has been incorporated into military, commercial, and civilian applications, to include navigation, agriculture, banking, cartography, telecommunications, and transportation. The current GPS constellation is robust and healthy, consisting of 30 operational satellites.

Last year, we launched the final of twenty GPS IIR satellites, the last eight of which were upgraded GPS IIR-M satellites with military code (M-code) for additional anti-jam capability, and a second "L2C" civil signal for increased accuracy. The GPS IIR program was started over twenty years ago, and represents one of our most successful, enduring space acquisition

programs. In May of this year, we plan to launch the first GPS IIF satellite, and twelve GPS IIF satellites will sustain the constellation over the next six years. GPS IIF will continue to populate the GPS constellation with military capability and introduce a third "L5" civil signal.

Moving beyond GPS IIF, GPS III will offer significant improvements in navigation capabilities by improving interoperability and jam resistance. The procurement of the GPS III system will occur in multiple blocks, with the initial GPS IIIA contract awarded in May 2008. GPS IIIA includes all of the GPS IIF capability plus a ten-fold increase in signal power, a new civil signal compatible with the European Union's Galileo system, and a new spacecraft bus that will support a graceful growth path to future blocks. The next generation control segment (OCX) for GPS III contract was awarded on February 25, 2010, and is on-track to be in place to support the first GPS IIIA launch, as well as continue to support the legacy GPS satellites. Finally, development of Military GPS User Equipment (MGUE) continues with technology maturation of modernized receiver cards that will take advantage of the increased capability of GPS IIIA including a stronger and more secure M-code signal.

WEATHER

The Defense Meteorological Satellite Program (DSMP) continues to be the nation's workhorse for terrestrial forecasting and space environmental sensing. DMSP Flight 18 was successfully launched in October 2009. We have two DMSP satellites remaining with Flight 19 and 20, and they are currently undergoing a Service Life Extension Program (SLEP) to repair, replace, and test components that have exceeded their shelf life. Flight 19 will launch in October 2012 and Flight 20 will launch in May 2014 or October 2016, depending on operational requirements.

On February 1, 2010, the Executive Office of the President restructured the National Polar-Orbiting Operational Environmental Satellite System (NPOESS) program to assign responsibility for each of the three planned orbits to the agency holding the majority of the interest in that orbit. Accordingly, the Department of Commerce will populate the afternoon orbit, the Department of Defense (DoD) will populate the early morning orbit, and the U.S. Government will continue to rely on capabilities from our European partners for the mid-morning orbit. For the morning orbit, DMSP satellites will continue to ensure weather observation capability. The DoD, in cooperation with partner agencies, will conduct a short requirements analysis for the morning orbit to serve as the basis to restructure the program in FY2011. While this analysis is conducted, DoD will work closely with the civil agency partners to ensure efforts to ensure continuity of the afternoon orbit continue productively and efficiently.

OPERATIONALLY RESPONSIVE SPACE

Operationally Responsive Space (ORS) is focused on meeting the urgent needs of the joint force commanders using a combination of existing, ready to field, and emergent systems. This program builds on the "back to basics" approach we have cultivated over the past several years by providing enhanced mission capability through incremental blocks of small satellites and integration of other responsive space capabilities. Key tenets of the ORS program are to keep costs low, react rapidly to urgent warfighter needs, and reconstitute capability in contested environments. A clear example of these tenets is exemplified in the first ORS operational satellite (ORS-1), scheduled to launch at the end of 2010. It is being built for United States Central Command (USCENTCOM) to monitor denied areas and will be taskable like other USCENTCOM organic airborne ISR assets.

In the FY2011 budget request, ORS will continue to develop the enabling infrastructure of on-demand space support with Rapid Response Space Capability, whereby plug-and-play spacecraft will be assembled, integrated, and tested with Modular Open System Architecture (MOSA) payloads, spacelift, satellite control, and data dissemination capabilities. Tactical Satellite 3 (TacSat-3), launched in May 2009, demonstrated this "plug and play" modular, low cost spacecraft with a hyper-spectral imaging payload. TacSat-3 provides a new capability for strategic and tactical reconnaissance from space, and continues to successfully provide military utility as a technology and test asset.

LAUNCH

National Space policy requires assured access to space. Currently this requirement is satisfied by the Evolved Expendable Launch Vehicle (EELV) program consisting of the Delta IV and Atlas V launch vehicles. The first 30 EELV launches have all been successful, and are part of our consecutive string of 64 successful national security space launches. Efficiencies are achieved through combined engineering, production, and launch operations while maintaining the separate Delta IV and Atlas V families of launch vehicles for assured access. The FY2011 budget request funds EELV launch capability (ELC), or infrastructure activities and on-going support for over eight launch services planned for 2011. In addition, we request funding for three EELV launch vehicles which will launch in 2013. We combined the two launch vehicle families into the United Launch Alliance (ULA), resulting in some cost savings due to labor reductions and facility consolidations; however, launch costs are still rising. Factors contributing to rising launch costs are the depletion of inventory purchased in prior years, reduced number of annual buys increasing unit costs, and a deteriorating subcontractor business base without

commercial customers. These industrial base factors will also be affected by the decision to replace NASA's Constellation program with a new, more technology-focused approach to space exploration, which will likely reduce the customer base for solid rocket motors and potentially increase demand for liquid engines and strengthen the liquid-fuel rocket industrial base. We have initiated several efforts to examine the severity of these business base issues and identify potential mitigation steps.

SPACE PROTECTION

The need for increased space protection of our space assets is paramount, and requires enhanced Space Situational Awareness (SSA) capabilities and a legitimate battle management system. We need improved accuracy, responsiveness, timeliness, and data integration to support the warfighter. Our FY2011 budget request continues development of the Joint Space Operation Center (JSpOC) Mission System (JMS) to provide this capability and replace our aging mission systems. The JMS program will provide a single, theater-integrated, command and control, information technology system to allow informed and rapid decisions with real-time, actionable SSA. An operational utility evaluation effort will deliver the foundational infrastructure and mission applications to deploy a services-oriented architecture (SOA) with user defined applications

The JSpOC is our single focal point for monitoring space activity. Over the last year, the JSpOC has transitioned the Air Force's commercial and foreign entities (CFE) pilot effort into USSTRATCOM's SSA sharing program. This involved growing the capability to monitor and conduct conjunction assessments for all U.S. government, commercial, and foreign active satellites, over 1,000 systems. As a result, the SSA sharing program screens for collisions daily,

and has a formalized information sharing process that reports potential conjunctions to commercial and foreign satellite owners and operators.

The Space Fence and Space-Based Space Surveillance (SBSS) are two programs critical to providing increased SSA data. The Space Fence is a three station, worldwide, radar system to detect and track smaller sized space objects, while the SBSS satellite is an optical system to search, detect, and track objects in earth orbit, particularly those in geosynchronous orbit. The Space Fence replaces the Air Force Space Surveillance System (AFSSS), and SBSS builds upon our success with the Space Based Visible (SBV) technology demonstration. In the FY2011 budget, the industry teams working on the Space Fence program will complete a Preliminary Design Review, and the SBSS program will conduct on-orbit operations of the SBSS Block 10 satellite, planned to launch this summer. Additionally, we will continue efforts toward a SBSS follow-on by completing the acquisition strategy and conducting a full and open competition.

AIR FORCE MANAGEMENT OF SPACE

The Secretary of the Air Force recently directed a review on Headquarters Air Force management of space responsibilities. Since the Air Force's last reorganization of space management following the 2001 Space Commission, events and new authorities have changed how responsibilities were assigned. This study will assess the impact of those changes for planning and programming, acquisition, oversight, and coordination with other DoD components and agencies.

The Air Force Acquisition Improvement Plan serves as the strategic framework for re-instilling excellence in space systems acquisition. This plan focuses on workforce, requirements generation, budget discipline, source selections, and clear lines of authority.

Additionally, the plan builds on our "Back to Basics" philosophy, and leverages enduring principles from over 50 years of space acquisition experience.

The Air Force is committed to providing the best possible education, training, and career development to these professionals who operate, acquire, and enable our systems. Institutions like the Air Force Institute of Technology, Defense Acquisition University, and the National Security Space Institute are at the forefront of our efforts to educate and train these warriors. These organizations continue to provide the education and training necessary to sustain the space workforce, our most vital asset.

Dr Ashton Carter, Under Secretary of Defense for Acquisition, Technology and Logistics, recently testified, "I support, as does the Secretary, the initiatives the Congress directed when it unanimously passed the Weapon Systems Acquisition Reform Act (WSARA) of 2009. Acquisition Reform is one of DoD's High Priority Performance Goals presented in the Analytic Perspectives volume of the President's FY 2011 Budget. The Department is moving out to implement these initiatives. " The Air Force space program actions described above are consistent with WSARA implementation and DoD's Acquisition Reform and Hiring Process goals.

CONCLUSION

Our space systems are the envy of the world. Our infrared surveillance satellites are able to detect missile launches anywhere in the world; no other nation can do that. Our strategic communications systems allow the President precise and assured control over nuclear forces in any stage of conflict, and our wideband SATCOM systems rapidly transmit critical information between the continental U.S. to our front line forces; no one else has global,

secure, anti-jam communications. Our weather satellites allow us to accurately predict future conditions half a world away as well as in space. Our GPS constellation enables position knowledge down to centimeters and timing down to nanoseconds; no one else has deployed such a capability. These sophisticated systems make each deployed Soldier, Sailor, Marine, and Airman safer, and more capable.

In the FY2011 budget, continuity of service across our space portfolio and improved space protection is paramount. Our 'back to basics' strategy over the recent years is demonstrating results, as we continue toward securing the world's best space capabilities today and ensuring the same for our nation's future.

The space constellations and space professionals that deliver these capabilities are our critical asymmetric advantage. We must ensure the recapitalization and health of these constellations and continue the professional development of our future space leaders. Delivering space capabilities is complex, challenging, costly, yet rewarding. Although we have faced significant challenges, we are also making significant progress. I look forward to continuing to work with this Committee and thank you for your continued support of military space programs.

QUESTIONS SUBMITTED BY MEMBERS POST HEARING

April 21, 2010

QUESTIONS SUBMITTED BY MR. LAMBORN

Mr. LAMBORN. Air Force Space Command established 24th Air Force as the Air Force's operational component to STRATCOM. While there is a lot of attention being given to cyber, especially from a defensive standpoint, we are still catching up to the threat. What have we done in regard to cyber and what needs doing immediately in your opinion? I would also be interested to hear if there is anything that we can do to help speed our cyber defense from a policy, resources, or legal standpoint.

General KEHLER. The Air Force has evolved its defensive strategy from a static perimeter defense strategy that focused on defending the network to a more dynamic and operational approach that focuses on assuring the mission and safeguarding the network.

Our previous strategy relied on a series of sensors located at the entry point to each base. These intrusion detection systems were leading technology 15 years ago, but are no longer suitable for defending the Air Force portion of the Department of Defense (DOD) network.

Twenty-Fourth Air Force (24 AF) has operationalized our approach to network defense. They have stood up an operations center (the 624th Operations Center) that has the ability to plan defensive operations and strategies and then command and control, and assess the execution of the plan by 24 AF units. They are also integrating network intelligence capabilities with the National Security Agency (NSA) and the Air Force Intelligence, Surveillance, and Reconnaissance Agency (AFISRA), to help make us more proactive and get ahead of the threat. Finally, we are upgrading the Air Force Network to make it more securable by migrating multiple network enclaves into a single, more defendable, network. This will enhance our ability to patch and command and control our network resources.

Mr. LAMBORN. While the National Space Policy and the Space Posture Review have not been completed, could you talk about how we might apply deterrence in space to the threats we face in the 21st century? Can we deter others from holding our space systems at risk? How might we respond to attacks against our space assets, and how do we manage the risk of escalation? Should we adopt clear "red lines" or thresholds for attacks against our space assets? What are the merits of a declaratory policy that signals our intent and lays out consequences?

Mr. BUTLER. The United States has not promulgated clear red lines for attacks against our space systems (e.g., satellite, ground, and space segments, and supporting links). However, our current National Space Policy states that our space capabilities are vital to our national interests, and we will preserve our rights, capabilities, and freedom of action in space. The Administration is reviewing the 2006 national space policy and will update Congress accordingly on any changes. On March 15, 2010, the Department of Defense (DOD) provided Congress with an "Interim" Space Posture Review, which provided our initial thinking on national security equities in space.

The United States reserves the right to take the full range of appropriate responses, including military action as consistent with the law of armed conflict. The United States considers space systems to have rights of passage through, and operations in, space without interference. This is consistent with U.S. law, applicable international law including the 1967 Outer Space Treaty, and existing (2006) national space policy. The United States views purposeful interference with its space systems as an infringement on its rights and will take those actions necessary to preserve its freedom of action in space.

DOD is addressing the possibility that some space systems may be unavailable during times of crisis and war via its operational and contingency planning processes. Numerous war games, such as the "Schriever" wargame series have shown that testing ourselves in a framework of diminished access to space may be an important part of our strategy development. Each of the Services conducted a "day without space" study to understand the impact of losing critical space capabilities; the results were stark and highlight the importance of your question.

There may be merit in employing voluntary, non-treaty approaches (e.g., international rules of the road and/or a code of conduct) for the space domain. Over the

past two years, the United States engaged in dialogue with European experts regarding the European Union's proposal for a "Code of Conduct for Outer Space Activities." In addition, the United States is participating in a multi-year study of "long-term sustainability of space activities" within the United Nations Committee on the Peaceful Uses of Outer Space. This study is examining the feasibility of voluntary "best practices guidelines" to help reduce operational risks to all space systems; it should serve as a valuable cooperation opportunity with established and emerging members of the space-faring community and with the private sector to enhance spaceflight safety and preserve the space environment for future generations.

In addition, DOD is continuing to develop concepts for best practices in space, and the Air Force is planning on conducting a simulation to assess the operational implications of a voluntary code as part of its May 2010 "Schriever" series wargame. The DOD is currently working with the office of the Director of National Intelligence to develop a National Security Space Strategy, which will further address questions of rules of the road/codes of conduct and declaratory policy.

Mr. LAMBORN. The Missile Defense Agency is commencing a new space acquisition program this year with the Precision Tracking Space System (PTSS). The bulk of our national security space acquisition has traditionally been accomplished by the Air Force and National Reconnaissance Office. What is the Air Force's reaction to MDA's rationale and justification for wishing to undertake its own space acquisition program?

Mr. PAYTON. MDA certainly has missile warning/missile defense domain expertise, as well as large, complex system development experience. Both of these are necessary to successfully develop PTSS. MDA has also reached out to the Air Force to leverage our space acquisition expertise. MDA has included an Air Force cell inside their PTSS Management Structure. This Air Force cell will assist MDA in designing the PTSS space segment and ground segment for long term operations and sustainment. The Air Force is migrating towards commonality among the space operations centers for command and control of spacecraft to minimize personnel, development, and operations and maintenance (O&M) costs. In addition, ground antennas, communications links, and infrastructure must be leveraged in order to minimize personnel and O&M costs as well.

QUESTIONS SUBMITTED BY MR. HEINRICH

Mr. HEINRICH. A reprogramming action submitted last month would provide $45M for Operationally Responsive Space. Can you describe the benefits this reprogramming will provide our warfighters?

General KEHLER and Mr. PAYTON. The reprogramming will cover funds required for the Operationally Responsive Space-1 (ORS–1) satellite program: an Intelligence, Surveillance, and Reconnaissance (ISR) system being built in response to an urgent need communicated by CDRUSSTRATCOM ORS–1 will be used predominately to address urgent Joint Force Commander needs in the USCENTCOM Area of Responsibility (AOR).

Mr. HEINRICH. It seems that much of the funding for ORS has occurred through these kinds of reprogramming actions as opposed to year-to-year budgeting. I fear this provides a lack of certainty and focus for the office as a whole. Since CENTCOM has expressed that it will likely need more of ORS–Sat 1's unique capability after its lifetime, why isn't the Department budgeting for this capability in the out-years?

General KEHLER and Mr. PAYTON. Recent Operationally Responsive Space (ORS) reprogramming actions have addressed near-term funding to field the ORS–1 satellite system to meet a USSTRATCOM urgent need in support of CENTCOM. The CENTCOM urgent need is met by planned ORS–1 spacecraft mission capabilities and projected lifetime. No funds for additional spacecraft are required for the out-years in the President's Budget.

Mr. HEINRICH. With the preponderance of all military assets (smart munitions, aircraft, tanks, naval ships, etc) relying on the Global Positioning System (GPS) to target, navigate and conduct its daily operations, one has to ask, are we ready to operate in a GPS denied environment?

General KEHLER and Mr. PAYTON. Efforts are underway on many fronts, through testing, simulation, exercises and gaming to develop NAVWAR Tactics, Techniques and Procedures (TTPs) and work through the effects of GPS denial. For the Air Force, our Space Aggressor and Test Squadrons, Weapons Schools and exercise teams are applying the most recent analysis and lessons learned to develop subject matter experts on GPS and NAVWAR to work through denial of service challenges.

[A portion of this response is classified and is retained in the subcommittee files].

Mr. HEINRICH. What are the current GPS denial capabilities of known/perceived enemies of the United States?

General KEHLER and Mr. PAYTON. [The information referred to is classified and is retained in the subcommittee files].

Mr. HEINRICH. What counter-measures are in place and on the horizon to combat GPS denial?

General KEHLER and Mr. PAYTON. On the horizon is the ability to use a new military-unique signal call M-code, which is more robust and powerful than the current signal. With the first GPS III satellites we will also have additional power available on M-code to further mitigate jamming.

[A portion of this response is classified and is retained in the subcommittee files].

Mr. HEINRICH. What impact would GPS denial have on current operations (strategic)?

General KEHLER and Mr. PAYTON. [The information referred to is classified and is retained in the subcommittee files].

Mr. HEINRICH. What impact would GPS denial have on the warfighter (tactical)?

General KEHLER and Mr. PAYTON. [The information referred to is classified and is retained in the subcommittee files].

Mr. HEINRICH. A reprogramming action submitted last month would provide $45M for Operationally Responsive Space. Can you describe the benefits this reprogramming will provide our warfighters?

Mr. BUTLER. The Department of Defense (DOD) submitted a March 2010 prior approval (PA) reprogramming action on April 8, 2010 that would reprogram $44.2 million in Fiscal Year (FY) 2009 Research, Development, Test, and Evaluation (RDT&E) funds for Operationally Responsive Space (ORS) (Budget Authority 4, Program Element (PE) 06040857F).

The explanation for the ORS PA reprogramming action stated the funds were required to

> maintain program schedule in support of the USCENTCOM's urgent need for Intelligence, Surveillance, and Reconnaissance (ISR) capability. During FY 2010, the program will complete fabrication of flight hardware, integrate key components including payload and modular bus, complete integration and test activities, and integrate the space vehicle with the Minotaur launch vehicle in preparation for the planned November 2010 launch. Without additional funding, the program will not be able to meet USCENTCOM's need for the December 2010 Initial Operational Capability.

All four defense committees (House Armed Services Committee, Senate Armed Services Committee, Senate Appropriations Subcommittee, and House Appropriations Defense Subcommittee (HAC–D)) supported the ORS PA. However, the HAC–D objected to the Global Hawk aircraft procurement decrease (-$48.9 million), which would have funded the ORS PA programming action.

The ORS PA reprogramming action is now authorized but remains unfunded, which means the program will not be able to meet USCENTCOM's need for the December 2010 Initial Operational Capability at this time. We intend to submit another ORS PA reprogramming action to meet USCENTCOM's need in the future.

Mr. HEINRICH. It seems that much of the funding for ORS has occurred through these kinds of reprogramming actions as opposed to year-to-year budgeting. I fear this provides a lack of certainty and focus for the office as a whole. Since CENTCOM has expressed that it will likely need more of ORS–Sat 1's unique capability after its lifetime, why isn't the Department budgeting for this capability in the out-years?

Mr. BUTLER. The Department of Defense (DOD) budgeted for Operationally Responsive Space (ORS) funding via several program elements (PEs) dating back to Fiscal Year (FY) 2003, when the Deputy Secretary of Defense (DepSecDef) directed the Air Force and the Defense Advanced Research Projects Agency (DARPA) in December 2002 to establish a joint program office to accelerate the ORS effort to meet the 2002 ORS Mission Needs Statement (MNS) requirements for responsive, on-demand access to, through, and from space.

ORS funding started under DARPA in FY 2003 (PE 0603285E, Force Application and Launch from CONUS (FALCON)) to comply with DepSecDef direction. In FY 2004, the Air Force opened PE 0604855F (Operationally Responsive Launch) in order to meet requirements from the 2002 ORS MNS. In FY 2007, the Air Force closed PE 0604855F and transferred funding to PE 0604857F (Operationally Responsive Space (ORS)) to recognize the broader scope of not just responsive space launchers, but also satellites and ranges, necessary for an ORS system.

ORS funding involves Budget Authority 4, Research, Development, Test and Evaluation (RDT&E) appropriations, which are two-year funds. DOD employs year-to-year budgeting and reprogramming actions in coordination with Congress to ensure

the best use of appropriated funds to achieve ORS objectives. The President's FY 2011 Budget funds ORS ($93.978 million); FY 2012–2015 out-year budget estimates average over $86.5 million per year, which demonstrates that DOD is planning and budgeting for ORS capability.

Mr. HEINRICH. With the preponderance of all military assets (smart munitions, aircraft, tanks, naval ships, etc) relying on the Global Positioning System (GPS) to target, navigate and conduct its daily operations, one has to ask, are we ready to operate in a GPS-denied environment?

Mr. BUTLER. Space-based Positioning, Navigation, and Timing (PNT) assets provide essential, precise, and reliable information that underpins nearly every military system and operation. PNT also contributes to precision attack, thereby helping to reduce collateral damage, and the ability to attack from stand-off distances, thereby allowing friendly forces to avoid threat areas.

The Global Positioning System (GPS) is the cornerstone of U.S. military PNT. The wide reliance on GPS, beyond the U.S. military, acts as a deterrent against attack on the constellation of GPS satellites. However, potential adversaries continue to seek means to counter the advantages we obtain from space and to use space capabilities against us. Navigation warfare (NAVWAR) ensures that friendly forces have unfettered access to PNT, while denying adversarial use of the same.

The Department of Defense (DOD) is addressing the possibility that space systems, including GPS, may be unavailable during times of crisis and war via its operational and contingency planning processes. Numerous war games, such as the "Schriever" wargame series have shown that testing ourselves in a framework of diminished access to space is an important part of our strategy development. Each of the Services conducted a "day without space" study to understand the impact of losing critical space capabilities; the results were stark and highlight the importance of your question.

NAVWAR was established to address increasing military dependence on PNT in the face of emerging threats to GPS. NAVWAR strategies include employing tactics and technologies to gain and maintain a PNT information advantage for the U.S. military and allies including the prevention of hostile GPS exploitation within an area of operations while preserving civil use of GPS outside the area of operations.

NAVWAR is deliberate military operations aimed at gaining and maintaining a PNT information advantage. Desired effects are generated through the coordinated employment of capabilities within Information, Space and Cyberspace Operations. The Joint Navigation Warfare Center (JNWC) was established under USSTRATCOM in Fiscal Year 2008 to integrate and coordinate NAVWAR across the DOD. Precise PNT has become one of the most critical enables of 21st century warfare. Therefore, it is imperative that access to very precise PNT remain unimpeded. The DOD can provide a classified presentation discussing specific NAVWAR issues or concerns at the committee's convenience.

Mr. HEINRICH. What are the current GPS denial capabilities of known/perceived enemies of the United States?

Mr. BUTLER. Global Positioning System (GPS) satellites broadcast navigation information on a continuous basis. The transmission has two levels of service—a standard positioning service (SPS) and a precise positioning service (PPS).

SPS is the unencrypted civilian positioning and timing service that is provided to all GPS users. PPS is a more accurate, military positioning, velocity, and timing service available to authorized encrypted users (U.S. military and some allies) on a worldwide basis with limited anti-jam capabilities. Access to PPS is controlled, and permits very precise matching of receiver-generated and satellite-generated waveforms; this allows precise measurement of the distance to each satellite.

GPS has several limitations that known/perceived enemies of the United States may use:

- Adversary use/exploitation of the GPS civil signal in their equipment can reduce the U.S. military advantage.
- GPS receivers are vulnerable to jamming.
- Jamming GPS can adversely affect civil and first responder operations, as well as joint military operations within a geographic area. The stronger the jammer, the larger the affected area.
- False signals, also known as "Spoofing." An adversary could generate false signals to mislead an authorized user with respect to PNT information. GPS has anti-spoofing technology designed to mitigate receiver compromise caused by intentionally misleading transmissions.

Combatant Commanders and their subordinate joint force commanders should factor potential GPS jamming into their Operations Plans. The Department of Defense

can provide a classified presentation discussing specific GPS denial issues or concerns at the committee's convenience.

Mr. HEINRICH. What counter-measures are in place and on the horizon to combat GPS denial?

Mr. BUTLER. Global Positioning System (GPS) satellites broadcast navigation information on a continuous basis. The transmission has two levels of service—a standard positioning service (SPS) and a precise positioning service (PPS).

SPS is the unencrypted civilian positioning and timing service that is provided to all GPS users. PPS is a more accurate, military positioning, velocity, and timing service available to authorized encrypted users (U.S. military and some allies) on a worldwide basis with limited anti-jam capabilities.

Access to PPS is controlled by use of cryptography (encryption keys loaded in the terminal units). The positioning code in each level of service permits very precise matching of receiver-generated and satellite-generated waveforms. This allows for precise measurement of the distance to each satellite.

GPS has anti-spoofing technology designed to mitigate receiver compromise caused by intentionally misleading transmissions. Future GPS planning enhancements include efforts to provide improved anti-jam capability.

The GPS acquisition strategy calls for continued development of GPS user equipment (UE) to support current warfighter activities and GPS Modernization aimed at maturing counter-measures. The GPS UE program will continue Selective Availability Anti-Spoofing Module (SAASM) receiver production, prepare for Military code (M-code) receiver development, and work with platforms/users to identify requirements and upgrade paths for further GPS enhancements. Additionally, several anti-jam technology efforts will be pursued to combat any potential threat that may deny GPS signals. The Department of Defense can provide a classified presentation discussing specific GPS denial issues or concerns at the committee's convenience.

Mr. HEINRICH. What impact would GPS denial have on current operations (strategic)?

Mr. BUTLER. The impact of Global Positioning System (GPS) denial on current operations (strategic) is dependent on the frequency and intensity of the denial. Each GPS satellite can store information on board for many days. In the event the GPS constellation cannot be updated, accuracy will gradually degrade. The rate of degradation is very slow in the first few days but increases with time. This allows GPS to be used for several days in a current operations (strategic) environment even if the update capabilities are interrupted.

GPS capabilities (e.g., space, control, and user segments) play a key role in military operations in all four domains (land, sea, air, and space). U.S. military forces use GPS for their space-based positioning, navigation, and timing (PNT) information. GPS assets provide essential, precise, and reliable information that permit joint forces to plan, train, coordinate, and execute operations more effectively.

The Department of Defense (DOD) uses GPS time as its standard to provide continuous global service. Service accuracy is determined by receiver type, number of GPS satellites in view, and satellite geometric configuration. However, GPS vulnerabilities to threats such as adversary exploitation, jamming, lack of line-of-sight reception, ionospheric scintillation, tropospheric errors, and signal multipath issues warrant that communication systems have a back-up capability to acquire timing information. The DOD can provide a classified presentation discussing specific GPS denial issues or concerns at the committee's convenience.

Mr. HEINRICH. What impact would GPS denial have on the warfighter (tactical)?

Mr. BUTLER. The impact of Global Positioning System (GPS) denial on the tactical warfighter is dependent on the frequency and intensity of the denial. Each GPS satellite can store information on board for many days. In the event the GPS constellation cannot be updated, accuracy will gradually degrade. The rate of degradation is very slow in the first few days but increases with time. This allows GPS to be used for several days in a tactical environment even if the update capabilities are interrupted.

GPS capabilities (e.g., space, control, and user segments) play a key role in military operations in all four domains (land, sea, air, and space). U.S. military forces use GPS for their space-based positioning, navigation, and timing (PNT) information. GPS assets provide essential, precise, and reliable information that permit joint forces to plan, train, coordinate, and execute operations more effectively. GPS gives the joint force the capability to improve communications security and effectiveness.

The Department of Defense (DOD) uses GPS time as its standard to provide continuous global service. Service accuracy is determined by receiver type, number of GPS satellites in view, and satellite geometric configuration. However, GPS vulnerabilities to threats such as adversary exploitation, jamming, lack of line-of-

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