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S. HRG. 112–80, PT. 7

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 2012 AND THE FUTURE YEARS DEFENSE PROGRAM

HEARINGS

BEFORE THE

COMMITTEE ON ARMED SERVICES
UNITED STATES SENATE

ONE HUNDRED TWELFTH CONGRESS

FIRST SESSION

ON

S. 1253

TO AUTHORIZE APPROPRIATIONS FOR FISCAL YEAR 2012 FOR MILITARY ACTIVITIES OF THE DEPARTMENT OF DEFENSE AND FOR MILITARY CONSTRUCTION, TO PRESCRIBE MILITARY PERSONNEL STRENGTHS FOR FISCAL YEAR 2012, AND FOR OTHER PURPOSES

PART 7
STRATEGIC FORCES

MARCH 30; APRIL 6, 13; MAY 11; JUNE 3, 2011

Printed for the use of the Committee on Armed Services

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Available via the World Wide Web: http://www.fdsys.gov/

U.S. GOVERNMENT PRINTING OFFICE

68–090 PDF WASHINGTON : 2012

For sale by the Superintendent of Documents, U.S. Government Printing Office
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DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 2012 AND THE FUTURE YEARS DEFENSE PROGRAM

WEDNESDAY, MARCH 30, 2011

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

STRATEGIC FORCES PROGRAMS OF THE NATIONAL NUCLEAR SECURITY ADMINISTRATION

The subcommittee met, pursuant to notice, at 2:38 p.m. in room SR–232A, Russell Senate Office Building, Senator E. Benjamin Nelson (chairman of the subcommittee) presiding.

Committee members present: Senators Nelson, Shaheen, and Sessions.

Committee staff members present: Leah C. Brewer, nominations and hearings clerk; and Jennifer L. Stoker, security clerk.

Majority staff members present: Madelyn R. Creedon, counsel; and Roy F. Phillips, professional staff member.

Minority staff members present: Daniel A. Lerner, professional staff member.

Staff assistants present: Hannah I. Lloyd and Brian F. Sebold.

Committee members' assistants present: Ann Premer, assistant to Senator Ben Nelson; Chad Kreikemeier, assistant to Senator Shaheen; and Lenwood Landrum, assistant to Senator Sessions.

OPENING STATEMENT OF SENATOR E. BENJAMIN NELSON, CHAIRMAN

Senator NELSON. This is the first of the Strategic Forces Subcommittee hearings in review of the fiscal year 2012 budget request.

I'm going to go ahead and start with my opening statement. I think my ranking member is on his way.

We have hearings now scheduled for April 6, which will address the strategic systems, bombers, intercontinental ballistic missiles (ICBM), and submarine launched ballistic missiles (SLBM); for April 13, which will address ballistic missile defense programs; and on May 4, which will address national security space programs.

Today, we have with us Mr. Tom D'Agostino, the Administrator of the National Nuclear Security Administration (NNSA). With Mr. D'Agostino are Dr. Donald Cook, the Deputy NNSA Administrator

for Defense Programs, and Admiral Kirkland Donald, Deputy NNSA Defense Administrator for Naval Reactors. We also have the directors of the three NNSA National Laboratories: Dr. Michael Anastasio, Director of Los Alamos National Laboratory (LANL); Dr. George Miller, Director of the Lawrence Livermore National Laboratory (LLNL); and Dr. Paul Hommert, Director of the Sandia National Laboratories.

We welcome you all to the hearing.

I would note that this is the first time that Admiral Donald and Dr. Cook have testified before the subcommittee. Sadly, this will be the last time that Dr. Anastasio will testify before the Senate Armed Services Committee in his capacity as Director of LANL, having announced his retirement, later this summer. You have had a long and distinguished career, and we wish you all the best in your future endeavors and thank you for all your service.

Last year, the Armed Services Committee, and the Senate as a whole, devoted considerable time and effort to consideration of the New Strategic Arms Reduction Treaty (START). The Senate Armed Services Committee alone held 11 hearings and briefings on the subject. The debate on the floor went on for almost 2 weeks before the New START treaty was ratified. One of the major issues discussed by the committee and the Senate was the ability of NNSA to maintain the nuclear weapons stockpile safely, securely, and reliably into the future.

A part of that debate and discussion was the overall well-being and funding of the nuclear complex, particularly, the new facilities that were needed at NNSA Y–12 facility in Oak Ridge, TN, and at LANL. Parts of this complex were described as "decrepit" by the bipartisan Strategic Posture Commission. I would note that each of these new facilities—the Uranium Processing Facility (UPF) at Y–12, and the new facility to replace the current Chemical and Metallurgical Resource Replacement (CMRR) facility, at Los Alamos—are multibillion-dollar facilities. The Government Accountability Office has put the NNSA on its high-risk list as a result of the difficulties that NNSA has had delivering major construction, and other projects, on scope, schedule, and budget. We look forward to hearing how NNSA will position itself to successfully deliver two new multibillion projects, both of which will be under construction at the same time.

The long-term ability of the NNSA laboratories to provide the technical support to the stockpile was also a topic of considerable discussion. Over the 5 years prior to 2010, funding for nuclear weapons work was substantially reduced. The labs went through significant layoffs. The result was a system that was beginning to lose its technical capability to support the stockpile for the long term.

To sustain the abilities of the nuclear weapons complex, President Obama laid out a 10-year plan last fall which included substantial annual increases in funding for fiscal years 2011, 2012, and beyond.

From the $6.4 billion appropriated for weapons activities in fiscal year 2010, the fiscal year 2011 funding was to be $7 billion, and the fiscal year 2012 budget request is $7.4 billion. This increase was to continue over the 10-year period. Some Senators argue that

even these substantial increases weren't enough, and voted against the New START treaty.

With the Continuing Resolution (CR), the long-term funding for NNSA isn't clear and, based on the proposals coming from the House of Representatives, could be substantially less than the funding requested by the President for both 2011 and 2012. One of the main issues of the hearing today will be the impact of the current funding uncertainty and the projected funding levels on the ability of NNSA to maintain the nuclear stockpile.

The Nuclear Posture Review (NPR) determined that it was essential for the United States to maintain a triad of nuclear delivery system: bombers, land-based ICBMs, and the submarine-launched ICBMs. To sustain the triad into the future, the NPR outlined the need for replacement programs for the current bomber fleet and a replacement for the *Ohio*-class ballistic missile submarines. The Office of Naval Reactors, which Admiral Donald heads, is a dual-entity of the NNSA and Department of the Navy, with responsibility for the design, development, operations, maintenance, and disposal of the nuclear propulsion plants on naval surface ships and submarines.

One of the primary ongoing missions of the Office of Naval Reactors is the development of a new reactor for the *Ohio*-class replacement ballistic missile submarines. The funding requested in the fiscal year 2011 and 2012 budgets is critical to keeping the reactor design process in sync with the overall design of the submarine.

Admiral Donald, we also look forward to discussing with you the impacts of the current funding situation on the *Ohio*-class replacement, as well as the other work of your offices.

I thank you all.

Now, it's my pleasure to turn this over to my good friend and ranking member, Senator Sessions.

STATEMENT OF SENATOR JEFF SESSIONS

Senator SESSIONS. Thank you, Mr. Chairman. It is a great pleasure for me to work with you. You know how much I respect and admire your leadership. I think, together, we'll do our best to fulfill our responsibilities to the taxpayers and to the security of America.

This hearing focuses on the President's fiscal year 2012 request for NNSA. Never has a nuclear weapons complex faced a turning point as significant, I think, as the one before us today. As highlighted by the bipartisan Perry-Schlesinger Strategic Posture Commission, a commission that I helped put the language in to create, both physical and intellectual infrastructure are "in serious need of transformation and require significant attention and investment. After years of neglect, the infrastructure has degraded to the point where we decide to recapitalize or forego the ability to certify and produce safe, secure, and reliable weapons." Today's hearing provides an opportunity to discuss the 2012 budget, assess its adequacy, and deliver a credible deterrent that is safe, secure, and reliable.

So, I welcome the commitment that the President has made for modernizing the nuclear weapons complex. While we may disagree on the likelihood that we'll have a nuclear-free world sometime in the future, the President has clearly recognized that the world we

live in today requires a strong nuclear deterrent and that efforts toward reducing the size of the stockpile depend on a modernized weapons complex, a robust ability to produce, refurbish, and replace legacy weapons with weapons that are safer, more secure, and reliable.

The 1251 report that's part of the New START Treaty was a key first step in ensuring the future viability of the complex. But, it was only a first step. A long-term sustained commitment that spans future administrations and Congresses alike is essential. Now, that's not always easy to do, to maintain a long-term defense project like this.

I am, however, already concerned that some in Congress have forgotten the national security importance of the weapons complex, and have neglected to appropriate what seems to be the necessary amount of funds for 2011. In fact, in the most recent full-year fiscal year 2011 appropriations bills, the House appropriators cut the fiscal year 2011 budget by $312 billion, and the Senate appropriators cut the weapons program by $185 billion. After countless hours of debate to fully fund the administration's 10-year-plus proposal during this Treaty debate, this failure to recognize the national security importance of complex modernization, I think, is disappointing. Hopefully, I'm wrong, and you can do the job without as much money as we originally thought. But, I'm worried about it.

Going forward, I intend to advocate for the restoration of the funds necessary to meet the goals that we set when we worked on the treaty together. The construction projects at Y–12 and LANL are the foundations of the modernization effort, and are the key enabler to a long list of warhead Life Extension Programs (LEP) over the next 20-plus years. I look forward to hearing more about these programs, understanding how NNSA intends to ensure that both facilities are delivered on time and on cost.

Cost is a big question on these projects, to me. In the report that accompanied the New START Treaty, and has since been updated, the current cost estimate for the CMRR is a range between $3.7 and $5.8 billion. That's a lot of money. Alabama's general fund budget is $2 billion a year. The cost estimate for the UPF is between $4.2 and $6.5 billion. Together, these buildings would cost between $7.9 and $12.3 billion. If necessary, okay. That's what we have to do. It's critical to our defense, so we have to do it. But, I don't think it's wrong for Congress to ask some questions about those high figures.

When it was released last year, the NPR included some troubling language that threatens to restrict the tools necessary for our weapons designers to design weapons with the highest degree of safety, security, and reliability. According to the NPR, warhead LEPs will "give strong preference to options for refurbishment or reuse," thus restricting the ability of the labs to pursue the benefits associated with the replacement option.

I remain concerned by this guidance, and associate myself with the concerns raised by 10 distinguished former lab directors who stated, in a letter to the Secretaries of Defense and Energy, that the NPR "will stifle the creative and imaginative thinking that typified the excellent history of progress and development at the

National Laboratories." I think that's a serious point that we must consider.

I look forward to hearing what steps have been taken to ensure our weapons designers will not be restricted from utilizing the tools necessary for developing the most credible, safe, secure, reliable stockpile possible.

Thank you, Mr. Chairman, and the witnesses.

Senator NELSON. Well, thank you, Senator Sessions. It's always a pleasure to work with you.

Senator Shaheen, do you have any opening remarks?

Senator SHAHEEN. No, thank you.

Senator NELSON. Okay. Mr. D'Agostino, I understand that you will present an oral opening statement on behalf of the panel. I would note that your prepared statement, as well as the statements of the three lab directors, will all be included in the subcommittee hearing record. Please proceed.

STATEMENT OF HON. THOMAS P. D'AGOSTINO, ADMINISTRATOR, NATIONAL NUCLEAR SECURITY ADMINISTRATION, AND UNDER SECRETARY FOR NUCLEAR SECURITY, DEPARTMENT OF ENERGY; ACCOMPANIED BY HON. DONALD L. COOK, DEPUTY ADMINISTRATOR FOR DEFENSE PROGRAMS, NATIONAL NUCLEAR SECURITY ADMINISTRATION, DEPARTMENT OF ENERGY; ADM KIRKLAND H. DONALD, USN, DEPUTY ADMINISTRATOR FOR NAVAL REACTORS, AND DIRECTOR, NAVAL NUCLEAR PROPULSION, NATIONAL NUCLEAR SECURITY ADMINISTRATION, DEPARTMENT OF ENERGY; MICHAEL R. ANASTASIO, DIRECTOR, LOS ALAMOS NATIONAL LABORATORY; GEORGE H. MILLER, DIRECTOR, LAWRENCE LIVERMORE NATIONAL LABORATORY; AND PAUL J. HOMMERT, DIRECTOR, SANDIA NATIONAL LABORATORIES

Mr. D'AGOSTINO. Thank you, Chairman Nelson, Senator Sessions, Senator Shaheen. It's a real pleasure to have the opportunity to address you today on a variety of investments that the President's proposing in the future for our Nation's nuclear security enterprise.

I'd like to begin by thanking all of the Senators on the committee for your continued support of our program, the Department of Energy (DOE), the NNSA, as well as the 35,000 men and women who work every day to keep our Nation safe.

We couldn't do our work without strong bipartisan support and, from my standpoint, the engaged leadership by Congress. It's absolutely critical, and this is actually what we've seen over the past number of years, in moving forward.

I'd also like to take a few moments to discuss our role in providing response to the tragic events in Japan. Mr. Chairman, the earthquake and tsunami that struck Japan on March 11, 2011, causing significant damage to the Fukushima Daiichi nuclear powerplant. Some of the radioactive materials have been released as a result of the damage. First and foremost, our thoughts and prayers are with the people of Japan during this very difficult time.

To assist in the response, we've deployed over 45 people and more than 17,000 pounds worth of equipment, including NNSA's aerial measuring system and consequence management response

teams. Our response teams are on the ground and they're utilizing their unique skills and expertise and equipment to help with our partners in Japan.

Since arriving in Japan, NNSA teams have collected and analyzed data gathered from more than 130 hours of flights aboard Department of Defense (DOD) aircraft and thousands of ground-monitoring points to get actual data on the ground and pass that information back to the Government of Japan.

But, in addition to that, in order to ensure that this information is available to every single government agency, we've been moving this information throughout the government, as well as posted information online at our Web site, energy.gov, so members of the public can see this information themselves, evaluate it for themselves, and be informed. We'll continue to monitor this situation. We continue to provide detailed technical support for the Japanese; in fact, on a daily basis. It changes dramatically on a daily basis.

DOE is also monitoring activities throughout—with a nuclear incident team that we have manned 24/7, with our naval reactors, as well. We get together and exchange data. We report our assets at our National Laboratories to provide ongoing predictive atmospheric monitoring capabilities based on a variety of different scenarios.

It's important to note that all of the data that we have seen to this point reaffirms what the President has said from the beginning, that we do not expect any harmful levels of radiation from Japan to reach the United States.

Mr. Chairman, I come before you today to discuss the President's fiscal year 2012 budget request. I do so at a time when the capabilities NNSA offers the Nation, and indeed the world, are on display in real time. The resources President Obama is requesting for fiscal year 2012 make a critical investment in the future of the nuclear security enterprise which will allow us to continue to implement his nuclear security agenda and respond to global crises like the one in Japan.

Despite the challenging economic times facing our country, President Obama has requested $11.8 billion for NNSA, up from $11.2 billion in 2011. As I see it, the budget request can be broken down into three key themes.

First, we're investing in the future. This budget request reflects the President's commitment, made last November, to invest more than $85 billion over the next decade to assure the safety, security, and effectiveness of our nuclear stockpile and to modernize the nuclear security infrastructure and revitalize the science and technology base that supports the full range of nuclear security missions that we have. It provides $7.6 billion for the weapons activities account to support our efforts to leverage the best science and technology and research in the world to maintain our deterrent and modernize the infrastructure that supports the deterrent. This will enable us to enhance our surveillance of the stockpile, proceed with key LEPs for the B61 and the W78 weapons systems, and continue to design the UPF at Y–12 National Security Complex, and the CMRR facility at LANL. These two facilities will provide the necessary capabilities that are absolutely critical to maintaining the Nation's expertise in uranium processing and plutonium research.

Investing in a modern nuclear security enterprise is critical to our Stockpile Stewardship Program (SSP), but it also supports the full range of NNSA's nuclear security missions.

Which brings me to the second theme in this request, which is implementing the President's nuclear security agenda. President Obama has made strengthening nuclear security and the nuclear nonproliferation regime one of his top priorities. As he said in his speech in Prague in April 2009, the threat of a terrorist acquiring and using a nuclear weapon is the most immediate and extreme threat we face. This budget makes the investments needed to continue to implement the President's nuclear security agenda.

To power the nuclear Navy, President Obama has requested $1.1 billion for NNSA's naval reactors program. The NPR highlighted the need to build a replacement for the *Ohio*-class submarine, which will start to be retired from Service in 2027. Our fiscal year 2012 request continues the design work on the propulsion unit for that *Ohio*-class replacement submarine in order to meet the Navy's required procurement date of 2019.

This budget request also includes critical investments in a modern and sustainable spent nuclear fuel infrastructure at the naval reactor site at the Idaho National Laboratory. This will allow us to move fuel away from wet to dry storage, and ultimately, to dispose of it, while we maintain the capacity necessary to receive spent fuel generated during a sustained intense period of fuel handling at our shipyards.

Finally, the budget request seeks the resources to refuel the land-based prototype reactor in upstate New York.

These are all critical elements of the President's nuclear security agenda defined in the national security strategy and in the NPR.

Mr. Chairman, we recognize that this request for increased investments in the nuclear security enterprise comes at a time of acute financial challenges to our Nation. We recognize that we have the need to be effective stewards of the taxpayers' money.

This brings me to the third key theme outlined in this budget, and that is our commitment to improving the way we do business and manage our resources, including budget resources, people resources, projects, and our infrastructure. I realize that you, the ranking member, and all members of this committee have many competing requirements. While I believe that nothing is more important than our shared responsibility to ensure our Nation's security, I also recognize that it's my responsibility to assure you that we can manage those resources wisely. That's why we are working with our management and operating partners to streamline our governance model to devote more resources to critical mission work and maximize our ability to complete our missions safely and securely, and do that in a cost-effective way. We're making sure that we have the right contracting strategy in place. We are improving our project management by ensuring we have qualified project managers leading our major projects, setting costs and schedule baselines on construction projects when design work is 90 percent complete, subjecting those estimates to rigorous independent reviews, and placing renewed focus across our enterprise on project management. That's why we recently created a new Policy and Oversight Office for managing major projects that reports directly

to me and my office to make sure that this project management responsibility gets the high level of management attention it deserves.

We're continuing to find innovative ways to save money across our enterprise. Take, for example, our supply-chain management center. Since 2009, it has used new technologies and pooled purchasing power to drive efficiencies across our enterprise. The result has been more than $213 million in auditable cost savings in the last 3½ years.

All of this is part of our effort to create one NNSA, a true partnership between all of our programs and all of our Management and Operations (M&O) partners across the country to fulfill our common mission. We must break down our stovepipes, work collaboratively across our programs and organization, make sure our headquarters, site offices, and M&O partners are coordinated, and leverage all of our resources to meet a common objective, ultimately making the world a safer place.

Taken together, these steps will ensure that we have a modern 21st-century nuclear security enterprise that is safer, more secure, more efficient, and organized to succeed, and an enterprise that can address broader national security needs.

We're already realizing positive benefits as a result of our work. Last year, our Kansas City plant won the Malcolm Baldrige Award for quality. Since October, two NNSA projects have won separate Project Management Institute (PMI) awards, including our Global Threat Reduction Initiative that became the first Federal project to ever win PMI's Distinguished Project Award. That's the vision outlined in this budget request. It supports our full range of NNSA missions and, more importantly, invests in the infrastructure, in the people, in the science and technology and engineering required to fulfill our missions.

I look forward to working with you and the members of the committee.

With that, we'd be happy to take any questions that you may have.

[The prepared statements of Mr. D'Agostino, Dr. Anastasio, Dr. Miller, and Dr. Hommert follow:]

PREPARED STATEMENT BY HON. THOMAS P. D'AGOSTINO

Chairman Nelson, Ranking Member Sessions, and members of the subcommittee, thank you for the opportunity to testify regarding our nuclear security posture and the President's fiscal year 2012 budget request for the National Nuclear Security Administration (NNSA).

I am pleased to be joined at the table by Dr. Don Cook, Deputy Administrator for Defense Programs and Admiral Kirk Donald, Director for Naval Nuclear Propulsion. We are also pleased to have the Directors of the National Laboratories—Dr. Michael Anastasio from Los Alamos National Lab, Dr. George Miller from Lawrence Livermore National Lab, and Dr. Paul Hommert from Sandia National Laboratories—join us for this hearing.

The NNSA has the important mission to enhance global security through nuclear deterrence, nonproliferation, counterterrorism, naval nuclear propulsion, and national leadership in science and technology. Today I am going to focus on how we at NNSA are: (1) investing in the future of the nuclear security enterprise, (2) implementing the President's nuclear security agenda, and (3) improving the way we do business and manage our resources from the standpoint of the status of the nuclear stockpile and supporting infrastructure. These key mission areas are interdependent, and the men and women who support them make a direct contribution to advancing national and international security.

Now more than ever, we must remain vigilant in ensuring that nuclear security programs and activities are properly managed in this tough budget climate. The national consensus that has developed following the Nuclear Posture Review (NPR) and the New START treaty ratification on the need to modernize our arsenal and promote all aspects of nuclear security across the spectrum of deterrence, proliferation prevention, counterterrorism and response further underpins the need to execute this mission responsibly and effectively.

THE NUCLEAR SECURITY POLICY CONTEXT AND NNSA'S ROLE

The policy context remains one in which the advancement of global nuclear security is a priority. When President Obama revealed his vision for reducing nuclear dangers and moving toward a world without nuclear weapons, he made clear that "as long as these weapons exist, the United States will maintain a safe, secure and effective arsenal to deter any adversary, and to guarantee that defense to our allies."

NNSA has been implementing the NPR guidance to ensure a safe, secure and effective arsenal and promote global nuclear security. With the entry into force of the New START treaty we are able to project what the stockpile will look like, to plan an integrated program that meets established military requirements, and to modernize the stockpile and infrastructure to support a leaner, modern 21st century Nuclear Security Enterprise.

The ratification of the New START treaty brought the administration and Congress together on the need to modernize the Nation's nuclear arsenal, and to provide greater resources to the science and technology missions, the aging physical infrastructure, and the people that support our strategic deterrent. We have agreed with the Russian Federation and within the United States to decrease the number of operationally deployed nuclear weapons, but we must not lose sight of the commitment needed to maintain the current stockpile and ensure it is safe, secure and effective. The President's budget requests in fiscal year 2011 and again in fiscal year 2012 reflect this commitment in the clearest and most comprehensive terms.

21ST CENTURY NUCLEAR SECURITY ENTERPRISE

While NNSA's primary mission is to maintain and deliver the Nation's nuclear deterrent to the Department of Defense, the expertise and tools used to accomplish that task have resulted in a multitude of other national security applications. The network of laboratories, production plants and sites that make up the Nuclear Security Enterprise evidences not only a shift from the Cold War capacity-based nuclear weapons complex, but a vision for preserving and enhancing one of our Nation's greatest national assets.

This shift from a weapons complex into a nuclear security enterprise is about making adjustments to the program in order to prevent and respond to current and emerging global threats, particularly in relation to countering a wide-ranging set of nuclear threats such as preventing—or minimizing the impact of—the explosion of an improvised nuclear device or radiological dispersal device. It is about staying ahead and advancing cutting edge science and technology to carry out this mission.

BUDGET HIGHLIGHTS

The President's fiscal year 2012 budget request provides $11.78 billion to invest in a modern, 21st century nuclear security enterprise, implement the President's nuclear security agenda, and improve the way the NNSA does business and manages its resources.

The fiscal year 2012 request represents an increase of 5.1 percent over the $11.2 billion requested for fiscal year 2011, reflecting a commitment to investing in a modern enterprise that can support the full range of nuclear security missions. The request highlights the vital role NNSA plays in implementing the President's nuclear security agenda and the broad, bipartisan consensus that has developed regarding the role NNSA plays in enhancing our Nation's security and the resources needed to get the job done.

Investing in the Future

Secretary of Energy Chu and I work closely with Secretary of Defense Gates and other Defense Department (DOD) officials to ensure that NNSA remains focused on a strong interagency partnership that meets our national security requirements and promotes NNSA's sustainability. As a result, the President's request includes $7.6 billion for the Weapons Activities appropriation, an 8.9 percent increase over the President's fiscal year 2011 request and a 19.5 percent increase over the fiscal year 2010 appropriation to invest in the future of the nuclear security enterprise. These

resources will support, among other things, the operation and construction of the modern research facilities needed to do cutting edge science and attract the next generation of nuclear security experts. It continues implementation of the President's commitment to invest $85 billion over the next decade to sustain the nuclear deterrent and to modernize the infrastructure that supports it, as well as to implement the agenda outlined in the NPR, the Stockpile Stewardship and Management Plan, and the updated Section 1251 Report submitted to Congress.

NNSA's budget request also includes associated out-year projections in the Future-Years Nuclear Security Program that identifies resources needed to meet the continuing requirements for significant long-term investments in the deliverables, capabilities, and infrastructure of the enterprise.

These resources will help us invest in a modern, 21st century Nuclear Security Enterprise that can sustain the stockpile and support our full range of nuclear security missions. With these investments, NNSA will be able to continue to move toward an enterprise that is safer, smaller, more secure, more efficient, more sustainable, and more adaptable.

The request includes an increase of 3.1 percent over the fiscal year 2011 level to protect and advance the scientific capabilities at the U.S. national security laboratories and a 21 percent increase for infrastructure improvements, including continuing work on the Uranium Processing Facility (UPF) at the Y–12 National Security Complex and the Chemistry and Metallurgy Research Replacement facility (CMRR) at Los Alamos National Laboratory. These capital projects are key elements for ensuring safe, secure, and reliable uranium and plutonium capabilities for nuclear security and other important missions.

To power the nuclear navy, the budget request includes $1.2 billion for the NNSA's Naval Reactors program, an increase of 7.8 percent over the President's fiscal year 2011 request. The programs in this appropriation support the U.S. Navy's nuclear fleet. Specifically, the request supports the administration's decision to recapitalize the sea-based strategic deterrent. The *Ohio*-class ballistic submarines, the most survivable leg of the Nation's strategic deterrent, are reaching the end of their operational life. The request will enable Naval Reactors to continue reactor plant design and development efforts begun in 2010 for procurement of long-lead reactor plant components in 2017, in support of Navy procurement of the first *Ohio* Class submarine replacement in 2019. Providing the *Ohio*-class replacement a life-of-the-ship reactor core will require substantial advances in manufacturing technology to provide new cladding and a new fuel system. The request also supports the refueling of a land based prototype reactor, providing a cost effective test platform for these new technologies.

Increased funding is also requested for the Spent Fuel Handling Recapitalization Project, which will replace the over 50-year old Expended Core Facility as the location for naval spent nuclear fuel receipt, inspection, dissection, packaging, and secure dry storage. Fiscal year 2012 funding continues the conceptual design for the facility, equipment, and related systems, as well as continues meeting the National Environmental Policy Act's requirements and project oversight (e.g., engineering procurement and construction management). Detailed project engineering and design work will commence in fiscal year 2013 and construction will commence in fiscal year 2015.

These vital projects will replace facilities that date back to the dawn of the Cold War with modern facilities that can support the full range of nuclear security missions—including maintaining the nuclear deterrent, preventing proliferation, securing vulnerable nuclear material, powering the nuclear Navy and providing the Nation with the best emergency response and counterterrorism capabilities possible. They will also ensure that NNSA continues to work with the Department of Defense and other interagency partners to keep the Nation safe.

Implementing the President's Nuclear Security Agenda

The fiscal year 2012 budget request also provides the resources required to continue to work toward the President's commitment to secure the most vulnerable nuclear material around the world within 4 years, a key national security goal. The budget request includes $2.5 billion for Defense Nuclear Nonproliferation in fiscal year 2012 and $14.2 billion over the next 5 years to reduce the global nuclear threat by detecting, securing, safeguarding, disposing, and controlling nuclear and radiological material worldwide, as well as promoting the responsible application of nuclear technology and science. Working together across the nuclear security enterprise, and in collaboration with our colleagues in a range of U.S. agencies, as well as with international organizations and partners in over 100 countries, we carry out these efforts globally on a daily basis.

This request reflects the significant accomplishments of NNSA's nuclear nonproliferation programs and seeks the resources needed to complete the President's goals and prepare to respond to new challenges. This budget request provides the resources required to meet commitments secured from international partners during the 2010 Nuclear Security Summit to remove all remaining highly enriched uranium (HEU) from Belarus, Ukraine, Mexico, and other countries by April 2012, expand our efforts to prevent nuclear materials trafficking, encourage global implementation of higher standards for the physical protection of nuclear material and nuclear facilities and work with the Defense Department to improve international nuclear security cooperation.

The request of $2.5 billion is a decrease of 5.1 percent from the President's fiscal year 2011 Request, but an increase of 19.6 percent over the fiscal year 2010 appropriation. This 5.1 percent or $138 million decline flows logically from the fiscal year 2011 request which was 'front loaded' to accelerate the effort to secure vulnerable nuclear materials within the President's stated timeframe. Even with this decrease, the NNSA's budget request remains consistent with our overall strategy to ensure that programs supporting the President's commitment to lead an international effort to secure the most vulnerable nuclear materials around the world in 4 years are fully funded in the Request. The Global Threat Reduction Initiative efforts related to radiological material, as well as the International Nuclear Material Protection and Cooperation program's activities to enhance the ability of our foreign partners to detect nuclear smuggling at border crossings and in Megaports have been prioritized to accelerate nuclear material lockdown efforts. The decrease in the request for Fissile Materials Disposition reflects the completion of long-lead procurements for the MOX and Waste Solidification projects, as well as the decision to defer funding associated with the $400 million U.S. pledge for the Russian Surplus Fissile Materials Disposition program until agreement is reached on milestones for the program. Prior Year unobligated balances of $30 million associated with contingency funds for construction under the Elimination of Weapons Grade Plutonium Production Program are proposed for cancellation, due to the program's anticipated completion of CD–4 activities in the June 2011 timeframe.

Improving the Way NNSA Does Business

In 2010, the NNSA observed 10 years of major accomplishments since its inception. We have secured and removed hundreds of nuclear weapons-worth of nuclear material around the world; we have built the world's fastest supercomputers and largest laser; we have pushed the frontiers of science and discovery on a daily basis; and we maintain an aging stockpile to ensure that it will remain a safe and effective deterrent. In the next decade, we have major projects to complete: the First Production Unit of the life extended B61 by 2017; addressing the W78 Life Extension Program and the potential commonality with the W88; and completing the design and construction of our plutonium and uranium capability at CMRR and UPF by 2020, with operations by 2023 and 2024 respectively. We also continue to reduce our security footprint by consolidating nuclear missions and materials. We are on track to complete removal of Category I/II Special Nuclear Materials from the Lawrence Livermore National Laboratory by the end of 2012, which will enable NNSA to reduce security risks and costs there.

We recognize that the fiscal year 2012 request for increased investments in the nuclear security enterprise comes at a time of acute financial challenges for our Nation, and we recognize the need to be effective stewards of the taxpayer's money. We have made a series of management decisions and put in place reforms and reorganizations to better reflect a 21st century mission and prepare us for the next 10 years of the NNSA.

Consistent with the President's commitment to deliver on critical national nuclear security missions at the best value to the American taxpayer, the fiscal year 2012 budget request will enable NNSA to continue to improve the way it does business and manages resources. The President's budget request for Federal oversight and staff included in the Office of the Administrator appropriation is $450.1 million, an increase of 0.4 percent over the fiscal year 2011 request and an increase of 7 percent over the fiscal year 2010 appropriation.

To maintain congressional support for NNSA's programs, the enterprise has a responsibility to work together as "One NNSA," a fully integrated enterprise that operates efficiently, is organized to succeed, that performs its work seamlessly, and speaks with one voice. This "One NNSA" needs to be a true partnership among Headquarters, the Site Offices and our Management and Operations (M&O) partners. We are working from the senior management level to ensure all 35,000 employees develop a culture where we all work in a more integrated and interdependent fashion.

Changing the way NNSA does business is an important part of the effort to transform a Cold War nuclear weapons complex into a 21st Century Nuclear Security Enterprise. NNSA simply cannot expect Congress to support major investments in its programs and its facilities unless the enterprise can demonstrate that the Department of Energy is a responsible steward of the taxpayer's money.

NNSA needs to do better, which is why the Federal sector leadership is working with its M&O partners to streamline the enterprise governance model in order to devote more resources to critical mission work and maximize NNSA's ability to complete its mission safely and securely.

NNSA is making sure that it has the right contracting strategy in place. The agency is improving its project management by, for example, ensuring that NNSA no longer sets cost and schedule performance baselines on construction projects until design work is 90 percent complete, ensuring it has the right leadership teams in place, and performing independent cost reviews. NNSA has also created a new policy and oversight office for managing major projects, the office of "Acquisitions and Project/Construction Management." The new office reports directly to the Administrator. This will help ensure that project management gets the high level focus it requires. In addition, we are moving to Federalize pilots for our secure transportation program in order to gain efficiencies and maintain operational control. Finally, as the Facilities Infrastructure and Recapitalization Program comes to an end, we will create the Capabilities Based Facilities and Infrastructure activity to continue to focus on maintaining the infrastructure we have.

We are already beginning to see results. NNSA is increasingly recognized for its efforts to be an effective steward of tax dollars. For example, since 2007, NNSA's Supply Chain Management Center has saved $213 million by using pooled purchasing power to drive efficiencies across the enterprise. In the last year NNSA's Kansas City Plant won the prestigious Malcolm Baldrige Award, America's highest honor for innovation and performance excellence. Two other NNSA programs were recognized with Project Management Institute (PMI) awards. In 2010, the Global Threat Reduction Initiative became the first Federal project to receive PMI's Distinguished Project Award, while the National Ignition Facility at Lawrence Livermore National Laboratory received PMI's project of the year.

CONCLUSION

Our Nation has carefully evaluated its security needs in an international landscape that remains challenging and uncertain. NNSA has charted a path forward that shows our unwavering commitment to the Nation's security and enhances our formidable capabilities to address broader security challenges.

The NNSA is a technically based organization with a strong nuclear heritage that serves as the base for our contribution to a wide range of national security solutions. NNSA is rooted in the management of our Nation's nuclear weapons stockpile, the application of nuclear energy for naval propulsion and its nonproliferation programs. Additionally, NNSA capabilities support a broad range of U.S. and international activities that address existing dangers, identify and prepare for future challenges, and advise the U.S. Government and our international partners on nuclear security matters.

This 5 year budget request takes the NNSA well into its second decade and strengthens the capabilities that are integral elements of our nuclear deterrent. Our challenge is to retain the essential capabilities and to identify and develop those needed for the future.

APPROPRIATIONS DETAIL

Following are more detailed descriptions of each of the four specific NNSA appropriations.

National Nuclear Security Administration

Appropriation and Program Summary Tables
Outyear Appropriation Summary Tables

FY 2012 BUDGET TABLES
National Nuclear Security Administration

Overview
Appropriation Summary

(dollars in thousands)

	FY 2010 Actual Approp	FY 2011 Request	FY 2011 CR	FY 2012 Request	FY 2012 vs. FY 2010 $	FY 2012 vs. FY 2010 %	FY 2012 vs. FY 2011 $	FY 2012 vs. FY 2011 %
National Nuclear Security Administration								
Office of the Administrator	420,754	448,267	420,754	450,060	29,306	7.0%	1,793	0.4%
Weapons Activities	6,386,371	7,008,835	7,008,835	7,629,716	1,243,345	19.5%	620,881	8.9%
Defense Nuclear Nonproliferation	2,131,382	2,687,167	2,136,709	2,549,492	418,110	19.6%	-137,675	-5.1%
Naval Reactors	945,133	1,070,486	945,133	1,153,662	208,529	22.1%	83,176	7.8%
Subtotal, NNSA	**9,883,640**	**11,214,755**	**10,511,431**	**11,782,930**	**1,899,290**	19.2%	**568,175**	**5.1%**
Transfer of prior year balances	-10,000	0	0	0	0	0%	0	0%
Total, NNSA	**9,873,640**	**11,214,755**	**10,511,431**	**11,782,930**	**1,899,290**	**19.2%**	**568,175**	**5.1%**

Outyear Appropriation Summary
NNSA Future-Years Nuclear Security Program (FYNSP)

(dollars in thousands)

	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
NNSA					
Office of the Administrator	450,060	442,992	441,242	441,522	440,591
Weapons Activities	7,629,716	7,948,673	8,418,480	8,683,538	8,905,597
Defense Nuclear Nonproliferation	2,549,492	2,771,068	2,907,934	2,983,984	3,038,395
Naval Reactors	1,153,662	1,232,278	1,289,917	1,474,200	1,569,800
Total, NNSA	**11,782,930**	**12,395,011**	**13,057,573**	**13,583,244**	**13,954,383**

Office of the Administrator

Overview
Appropriation Summary by Program

(dollars in thousands)

	FY 2010 Actual Appropriation	FY 2011 Request	FY 2011 Continuing Resolution	FY 2012 Request
Office of the Administrator				
Office of the Administrator	418,074	448,267	410,754	450,060
Congressionally Directed Projects	13,000	0	0	0
Use of Prior Year Balances	-10,320	0	0	0
Subtotal, Office of the Administrator	**420,754**	**448,267**	**410,754**	**450,060**
Transfer of Prior Year Balances	-10,000	0	0	0
Total, Office of the Administrator	**410,754**	**448,267**	**410,754**	**450,060**

Public Law Authorization:
Energy and Water Development and Related Agencies Appropriations Act, 2010 (P.L. 111-85)

Outyear Appropriation Summary by Program

(dollars in thousands)

	FY 2013	FY 2014	FY 2015	FY 2016
Office of the Administrator	**442,992**	**441,242**	**441,522**	**440,591**

Office of the Administrator

Congressionally Directed Projects
Funding Profile by Subprogram

(dollars in thousands)

	FY 2010 Actual Appropriation	FY 2011 Request	FY 2012 Request
Congressionally Directed Projects	13,000	0	0

Weapons Activities

Overview
Appropriation Summary by Program

(dollars in thousands)

	FY 2010 Actual Appropriation	FY 2011 Request	FY 2011 CR	FY 2012 Request
Weapons Activities				
Directed Stockpile Work	1,564,290	1,898,379		1,963,583
Science Campaign	294,548	365,222		405,939
Engineering Campaign	149,679	141,920		143,078
Inertial Confinement Fusion Ignition and High Yield Campaign	457,486	481,548		476,274
Advanced Simulation and Computing Campaign	566,069	615,748		628,945
Readiness Campaign	106,744	112,092		142,491
Readiness in Technical Base and Facilities	1,810,279	1,848,970		2,326,134
Secure Transportation Asset	240,683	248,045		251,272
Nuclear Counterrorism Incident Response	223,379	233,134		222,147
Program	95,575	94,000		96,380
Site Stewardship	63,308	105,478		104,002
Defense Nuclear Security	769,823	719,954		722,857
Cyber Security	123,338	124,345		126,614
National Security Applications	0	20,000		20,000
Congressionally Directed Projects	3,000	0		0
Use/Recission of Prior Year Balances	-81,830	0		0
Total, Weapons Activities	**6,386,371**	**7,008,835**	**7,008,835**	**7,629,716**

Public Law Authorization:
National Defense Authorization Act for Fiscal Year 2010 (P.L. 111-84)
Energy and Water Development and Related Agencies Appropriations Act, 2010 (P.L. 111-85)
National Nuclear Security Administration Act, (P.L. 106-65), as amended

Outyear Appropriation Summary by Program*

(dollars in thousands)

	FY 2013	FY 2014	FY 2015	FY 2016
Weapons Activities				
Directed Stockpile Work	2,111,439	2,327,859	2,529,992	2,630,707
Science Campaign	418,216	416,284	394,315	404,097
Engineering Campaign	168,418	165,898	159,449	158,693
Inertial Confinement Fusion Ignition and High Yield Campaign	476,381	471,668	485,237	495,026
Advanced Simulation and Computing Campaign	616,104	628,100	643,120	659,210
Readiness Campaign	130,753	130,754	133,706	135,320
Readiness in Technical Base and Facilities	2,484,259	2,742,504	2,729,657	2,734,890
Secure Transportation Asset	249,456	252,869	261,521	267,773
Nuclear Counterrorism Incident Response	219,737	232,680	236,045	242,205
Facilities and Infrastructure Recapitalization Program	94,000	0	0	0
Site Stewardship	104,699	175,370	207,488	212,706
Defense Nuclear Security	729,795	729,173	756,110	814,967
Cyber Security	125,416	125,321	126,898	130,003
National Security Applications	20,000	20,000	20,000	20,000
Total, Weapons Activities	**7,948,673**	**8,418,480**	**8,683,538**	**8,905,597**

* The annual totals include an allocation to NNSA from the Department of Defense's (DoD) Research, Development, Testing and Evaluation (RDT&E) account entitled: "NNSA Program Support." The amounts for Weapons Activities included from this DoD account are FY 2013, $433.172 million; FY 2014, $550.902 million; FY 2015, $854.900 million; and FY 2016, $637.933 million.

Directed Stockpile Work

Funding Profile by Subprogram

	(dollars in thousands)		
	FY 2010 Actual Appropriation	FY 2011 Request	FY 2012 Request
Directed Stockpile Work			
Life Extension Programs			
B61 Life Extension Program	0	0	223,562
W76 Life Extension Program	231,888	249,463	257,035
Subtotal, Life Extension Programs	**231,888**	**249,463**	**480,597**
Stockpile Systems			
B61 Stockpile Systems	114,195	317,136	72,396
W62 Stockpile Systems	2	0	0
W76 Stockpile Systems	65,451	64,521	63,383
W78 Stockpile Systems	52,167	85,898	109,518
W80 Stockpile Systems	20,107	34,193	44,444
B83 Stockpile Systems	36,689	39,349	48,215
W87 Stockpile Systems	53,848	62,603	83,943
W88 Stockpile Systems	42,743	45,666	75,728
Subtotal, Stockpile Systems	**385,202**	**649,366**	**497,627**
Weapons Dismantlement and Disposition	**95,786**	**58,025**	**56,770**
Stockpile Services			
Production Support	300,037	309,761	354,502
Research & Development Support	37,071	38,582	30,264
Research & Development Certification and Safety	189,174	209,053	190,892
Management, Technology, and Production	183,223	193,811	198,700
Plutonium Sustainment	141,909	190,318	154,231
Subtotal, Stockpile Services	**851,414**	**941,525**	**928,589**
Total, Directed Stockpile Work	**1,564,290**	**1,898,379**	**1,963,583**

Outyear Funding Profile by Subprogram

(dollars in thousands)

	FY 2013	FY 2014	FY 2015	FY 2016
Directed Stockpile Work				
Life Extension Programs				
B61 Life Extension Program	279,206	320,894	396,869	426,415
W76 Life Extension Program	255,000	255,000	255,000	260,099
Subtotal, Life Extension Programs	**534,206**	**575,894**	**651,869**	**686,514**
Stockpile Systems				
B61 Stockpile Systems	72,364	72,483	70,488	71,534
W62 Stockpile Systems	0	0	0	0
W76 Stockpile Systems	65,445	63,580	63,537	65,727
W78 Stockpile Systems	151,207	329,354	333,978	316,507
W80 Stockpile Systems	46,540	50,457	58,898	59,775
B83 Stockpile Systems	57,947	72,516	65,941	54,663
W87 Stockpile Systems	85,689	68,774	63,638	65,492
W88 Stockpile Systems	105,582	78,602	163,626	226,060
Subtotal, Stockpile Systems	**584,774**	**735,766**	**820,106**	**859,758**
Weapons Dismantlement and Disposition	**43,404**	**52,090**	**54,205**	**55,495**
Stockpile Services				
Production Support	319,805	320,614	332,371	341,203
Research & Development Support	31,059	31,824	33,116	33,904
Research & Development Certification and Safety	241,658	242,424	250,963	255,747
Management, Technology, and Production	199,080	207,290	215,468	222,137
Plutonium Sustainment	157,453	161,957	171,894	175,949
Subtotal, Stockpile Services	**949,055**	**964,109**	**1,003,812**	**1,028,940**
Total, Directed Stockpile Work	**2,111,439**	**2,327,859**	**2,529,992**	**2,630,707**

Science Campaign

Funding Profile by Subprogram

(dollars in thousands)

	FY 2010 Actual Appropriation	FY 2011 Request	FY 2012 Request
Science Campaign			
Advanced Certification	19,269	76,972	94,929
Primary Assessment Technologies	82,838	85,723	86,055
Dynamic Materials Properties	86,371	96,984	111,836
Advanced Radiography	28,489	23,594	27,058
Secondary Assessment Technologies	77,581	81,949	86,061
Total, Science Campaign	**294,548**	**365,222**	**405,939**

Outyear Funding Profile by Subprogram

(dollars in thousands)

	FY 2013	FY 2014	FY 2015	FY 2016
Science Campaign				
Advanced Certification	97,229	103,271	82,000	84,174
Primary Assessment Technologies	88,893	85,894	88,368	88,831
Dynamic Materials Properties	114,980	114,170	106,398	114,620
Advanced Radiography	26,816	26,528	27,421	26,473
Secondary Assessment Technologies	90,298	86,421	90,128	89,999
Total, Science Campaign	**418,216**	**416,284**	**394,315**	**404,097**

Engineering Campaign

Funding Profile by Subprogram

	(dollars in thousands)		
	FY 2010 Actual Appropriation	FY 2011 Request	FY 2012 Request
Engineering Campaign			
Enhanced Surety	41,928	42,429	41,696
Weapons Systems Engineering Assessment Technology	17,977	13,530	15,663
Nuclear Survivability	20,980	19,786	19,545
Enhanced Surveillance	68,794	66,175	66,174
Total, Engineering Campaign	**149,679**	**141,920**	**143,078**

Outyear Funding Profile by Subprogram

	(dollars in thousands)			
	FY 2013	FY 2014	FY 2015	FY 2016
Engineering Campaign				
Enhanced Surety	51,922	50,810	47,649	48,773
Weapons Systems Engineering Assessment Technology	21,233	21,502	21,244	21,699
Nuclear Survivability	24,371	25,691	26,079	26,318
Enhanced Surveillance	70,892	67,895	64,477	61,903
Total, Engineering Campaign	**168,418**	**165,898**	**159,449**	**158,693**

Inertial Confinement Fusion Ignition and High Yield Campaign

Funding Profile by Subprogram

(dollars in thousands)

	FY 2010 Actual Appropriation	FY 2011 Request	FY 2012 Request
Inertial Confinement Fusion Ignition and High Yield Campaign			
Ignition	106,575	109,506	109,888
Support of Other Stockpile Programs	0	0	0
Diagnostics, Cryogenics, and Experimental Support	72,144	102,649	86,259
Pulsed Power Inertial Confinement Fusion	4,992	5,000	4,997
Joint Program in High Energy Density Laboratory Plasmas	4,000	4,000	9,100
Facility Operations and Target Production	269,775	260,393	266,030
Total, Inertial Confinement Fusion Ignition and High Yield Campaign	**457,486**	**481,548**	**476,274**

Outyear Funding Profile by Subprogram*

(dollars in thousands)

	FY 2013	FY 2014	FY 2015	FY 2016
Inertial Confinement Fusion Ignition and High Yield Campaign				
Ignition	74,410	65,000	60,000	55,000
Support of Other Stockpile Programs	35,590	45,000	50,000	55,000
Diagnostics, Cryogenics, and Experimental Support	76,267	70,159	70,517	69,617
Pulsed Power Inertial Confinement Fusion	5,000	5,000	5,000	5,000
Joint Program in High Energy Density Laboratory Plasmas	9,500	9,500	9,500	9,500
Facility Operations and Target Production	275,614	277,009	290,220	300,909
Total, Inertial Confinement Fusion Ignition and High Yield Campaign	**476,381**	**471,668**	**485,237**	**495,026**

* Outyear funding profile does not include adjustments in response to the FY 2013 change in Self-Constructed Asset Pool (overhead rate at Lawrence Livermore National Laboratory). These adjustments will be reflected in the FY 2013 President's Budget.

Advanced Simulation and Computing Campaign

Funding Schedule by Subprogram

(dollars in thousands)

	FY 2010 Actual Appropriation	FY 2011 Request	FY 2012 Request
Advanced Simulation and Computing Campaign			
Integrated Codes	140,882	165,947	160,945
Physics and Engineering Models	61,189	62,798	69,890
Verification and Validation	50,882	54,781	57,073
Computational Systems and Software Environment	157,466	175,833	181,178
Facility Operations and User Support	155,650	156,389	159,859
Total, Advanced Simulation and Computing Campaign	**566,069**	**615,748**	**628,945**

Outyear Funding Profile by Subprogram

(dollars in thousands)

	FY 2013	FY 2014	FY 2015	FY 2016
Advanced Simulation and Computing Campaign				
Integrated Codes	160,170	163,287	167,194	171,377
Physics and Engineering Models	69,567	70,922	72,617	74,434
Verification and Validation	56,794	57,899	59,284	60,767
Computational Systems and Software Environment	170,462	173,782	177,937	182,389
Facility Operations and User Support	159,111	162,210	166,088	170,243
Total, Advanced Simulation and Computing Campaign	**616,104**	**628,100**	**643,120**	**659,210**

Readiness Campaign

Funding Profile by Subprogram

(dollars in thousands)

	FY 2010 Actual Appropriation	FY 2011 Request	FY 2012 Request
Readiness Campaign			
Stockpile Readiness	5,670	18,941	0
High Explosives and Weapon Operations	4,583	3,000	0
Nonnuclear Readiness	19,625	21,864	65,000
Tritium Readiness	68,245	50,187	77,491
Advanced Design and Production Technologies	8,621	18,100	0
Total, Readiness Campaign	**106,744**	**112,092**	**142,491**

Outyear Funding Profile by Subprogram

(dollars in thousands)

	FY 2013	FY 2014	FY 2015	FY 2016
Readiness Campaign				
Stockpile Readiness	0	0	0	0
High Explosives and Weapon Operations	0	0	0	0
Nonnuclear Readiness	65,000	65,000	65,000	65,000
Tritium Readiness	65,753	65,754	68,706	70,320
Advanced Design and Production Technologies	0	0	0	0
Total, Readiness Campaign	**130,753**	**130,754**	**133,706**	**135,320**

Readiness in Technical Base and Facilities

Funding Profile by Subprogram

(dollars in thousands)

	FY 2010 Actual Appropriation	FY 2011 Request	FY 2012 Request
Readiness in Technical Base and Facilities			
Operations of Facilities			
Kansas City Plant	117,895	186,102	156,217
Lawrence Livermore National Laboratory	86,083	80,106	83,990
Los Alamos National Laboratory	338,479	318,464	318,526
Nevada National Security Site	79,326	80,077	97,559
Pantex	131,227	121,254	164,848
Sandia National Laboratory	103,618	117,369	120,708
Savannah River Site	131,129	92,722	97,767
Y-12 National Security Complex	228,601	220,927	246,001
Institutional Site Support	120,041	40,970	199,638
Subtotal, Operations of Facilities	1,336,399	1,257,991	1,485,254
Program Readiness	72,873	69,309	74,180
Material Recycle and Recovery	69,224	70,429	85,939
Containers	23,321	27,992	28,979
Storage	24,558	24,233	31,272
Subtotal, Operations and Maintenance	**1,526,375**	**1,449,954**	**1,705,624**
Construction	283,904	399,016	620,510
Total, Readiness in Technical Base and Facilities	**1,810,279**	**1,848,970**	**2,326,134**

Outyear Funding Schedule by Subprogram

(dollars in thousands)

	FY 2013	FY 2014	FY 2015	FY 2016
Readiness in Technical Base and Facilities				
Operations of Facilities	1,655,922	1,673,863	1,681,568	1,699,396
Program Readiness	88,900	89,511	90,780	91,504
Material Recycle and Recovery	104,940	102,782	105,021	106,642
Containers	25,016	23,997	24,809	25,396
Storage	32,347	31,872	33,647	34,208
Subtotal, Operations and Maintenance	**1,907,125**	**1,922,025**	**1,935,825**	**1,957,146**
Construction	577,134	820,479	793,832	777,744
Readiness in Technical Base and Facilities	**2,484,259**	**2,742,504**	**2,729,657**	**2,734,890**

Secure Transportation Asset

Overview
Funding Profile by Subprogram

(dollars in thousands)

	FY 2010 Actual Appropriaton	FY 2011 Request	FY 2012 Request
Secure Transportation Asset (STA)			
Operations and Equipment	144,542	149,018	149,274
Program Direction	96,141	99,027	101,998
Total, Secure Transportation Asset	**240,683**	**248,045**	**251,272**

Outyear Funding Profile by Subprogram

(dollars in thousands)

	FY 2013	FY 2014	FY 2015	FY 2016
Operations and Equipment				
Operations and Equipment	141,560	142,270	146,865	150,561
Program Direction	107,896	110,599	114,656	117,212
Total, Operations and Equipment	**249,456**	**252,869**	**261,521**	**267,773**

Secure Transportation Asset

Operations and Equipment
Funding Profile by Subprogram

(dollars in thousands)

	FY 2010 Actual Appropriation	FY 2011 Request	FY 2012 Request
Operations and Equipment			
Mission Capacity	79,787	84,010	79,641
Security/Safety Capability	27,160	27,001	32,261
Infrastructure and C5 Systems	24,399	23,681	25,997
Program Management	13,196	14,326	11,375
Total, Operations and Equipment	**144,542**	**149,018**	**149,274**

Outyear Funding Profile by Subprogram

(dollars in thousands)

	FY 2013	FY 2014	FY 2015	FY 2016
Operations and Equipment				
Mission Capacity	69,715	69,033	73,476	72,771
Security/Safety Capability	32,715	32,817	32,923	33,030
Infrastructure and C5 Systems	26,583	27,621	27,411	31,444
Program Management	12,547	12,799	13,055	13,316
Total, Operations and Equipment	**141,560**	**142,270**	**146,865**	**150,561**

Secure Transportation Asset

Program Direction
Funding Profile by Subprogram

(dollars in thousands)

	FY 2010 Actual Appropriation	FY 2011 Request	FY 2012 Request
Program Direction			
Salaries and Benefits	78,301	83,311	87,307
Travel	7,337	7,746	8,024
Other Related Expenses	10,503	7,970	6,667
Total, Program Direction	**96,141**	**99,027**	**101,998**
Total, Full Time Equivalents	**584**	**637**	**622**

Outyear Funding Profile by Subprogram

(dollars in thousands)

	FY 2013	FY 2014	FY 2015	FY 2016
Program Direction				
Salaries and Benefits	91,067	93,307	96,888	99,038
Travel	8,301	8,550	8,806	8,984
Other Related Expenses	8,528	8,742	8,962	9,190
Total, Program Direction	**107,896**	**110,599**	**114,656**	**117,212**
Total, Full Time Equivalents	**649**	**649**	**649**	**649**

Nuclear Counterterrorism Incident Response

Funding by Subprogram

(dollars in thousands)

	FY 2010 Actual Appropriation	FY 2011 Request	FY 2012 Request
Nuclear Counterterrorism Incident Response (Homeland Security)*			
Emergency Response (Homeland Security)*	140,481	134,092	137,159
National Technical Nuclear Forensics (Homeland Security)*	10,227	11,698	11,589
Emergency Management (Homeland Security)*	7,726	7,494	7,153
Operations Support (Homeland Security)*	8,536	8,675	8,691
International Emergency Management and Cooperation	7,181	7,139	7,129
Nuclear Counterterrorism (Homeland Security)*	49,228	64,036	50,426
Total, Nuclear Counterterrorism Incident Response	**223,379**	**233,134**	**222,147**

Outyear Target Funding Profile by Subprogram

(dollars in thousands)

	FY 2013	FY 2014	FY 2015	FY 2016
Nuclear Counterterrorism Incident Response				
Emergency Response (Homeland Security)*	136,918	138,440	140,098	142,816
National Technical Nuclear Forensics (Homeland Security)*	11,694	11,577	11,828	12,274
Emergency Management (Homeland Security)*	6,629	6,506	6,694	6,776
Operations Support (Homeland Security)*	8,799	8,749	9,000	9,110
International Emergency Management and Cooperation	7,139	7,032	7,276	7,664
Nuclear Counterterrorism (Homeland Security)*	48,558	60,376	61,149	63,565
Total, Nuclear Counterterrorism Incident Response	**219,737**	**232,680**	**236,045**	**242,205**

* Office of Management and Budget (OMB) Homeland Security designation.

Facilities and Infrastructure Recapitalization Program

Funding Profile by Subprogram

(dollars in thousands)

	FY 2010 Actual Appropriation	FY 2011 Request	FY 2012 Request
Facilities and Infrastructure Recapitalization Program			
Operations and Maintenance (O&M)			
Recapitalization	70,483	79,600	81,980
Infrastructure Planning	6,153	9,400	9,400
Facility Disposition	8,976	5,000	5,000
Subtotal, Operations and Maintenance (O&M)	**85,612**	**94,000**	**96,380**
Construction	9,963	0	0
Total, Facilities and Infrastructure Recapitalization Program	**95,575**	**94,000**	**96,380**

Outyear Funding Profile by Subprogram

(dollars in thousands)

	FY 2013	FY 2014	FY 2015	FY 2016
Facilities and Infrastructure Recapitalization Program				
Operations and Maintenance (O&M)				
Recapitalization	86,600	0	0	0
Infrastructure Planning	2,400	0	0	0
Facility Disposition	5,000	0	0	0
Subtotal, Operations and Maintenance (O&M)	**94,000**	**0**	**0**	**0**
Construction	0	0	0	0
Total, Facilities and Infrastructure Recapitalization Program	**94,000**	**0**	**0**	**0**

Site Stewardship

Funding Profile by Subprogram

(dollars in thousands)

	FY 2010 Actual Appropriation	FY 2011 Request	FY 2012 Request
Site Stewardship			
Operations and Maintenance	63,308	90,478	104,002
Construction	0	15,000	0
Total, Site Stewardship	**63,308**	**105,478**	**104,002**

Outyear and Over Target Funding Profile by Subprogram

(dollars in thousands)

	FY 2013	FY 2014	FY 2015	FY 2016
Site Stewardship				
Operations and Maintenance	102,458	175,370	192,488	197,706
Construction	2,241	0	15,000	15,000
Total, Site Stewardship	**104,699**	**175,370**	**207,488**	**212,706**

Safeguards and Security

Funding Profile by Subprogram

	(dollars in thousands)		
	FY 2010 Actual Appropriations	FY 2011 Request	FY 2012 Request
Safeguards and Security (S&S)			
Defense Nuclear Security (Homeland Security)			
Operations and Maintenance	720,823	667,954	711,105
Construction	49,000	52,000	11,752
Total, Defense Nuclear Security	**769,823**	**719,954**	**722,857**
Cyber Security (Homeland Security)	**123,338**	**124,345**	**126,614**
Total, Safeguards and Security	**893,161**	**844,299**	**849,471**

Outyear Funding Profile by Subprogram

	(dollars in thousands)			
	FY 2013	FY 2014	FY 2015	FY 2016
Safeguards and Security (S&S)				
Defense Nuclear Security (Homeland Security)				
Operations and Maintenance	729,795	729,173	756,110	814,967
Construction	0	0	0	0
Total, Defense Nuclear Security	**729,795**	**729,173**	**756,110**	**814,967**
Cyber Security (Homeland Security)	**125,416**	**125,321**	**126,898**	**130,003**
Total, Safeguards and Security	**855,211**	**854,494**	**883,008**	**944,970**

Defense Nuclear Security

Funding Profile by Subprogram

(dollars in thousands)

	FY 2010 Actual Appropration	FY 2011 Request	FY 2012 Request
Defense Nuclear Security			
Operations and Maintenance (Homeland Security)			
Protective Forces	453,779	414,166	418,758
Physical Security Systems	74,000	73,794	107,636
Information Security	25,300	25,943	30,117
Personnel Security	30,600	30,913	37,285
Materials Control and Accountability	35,200	35,602	34,592
Program Management	83,944	80,311	77,920
Technology Deployment, Physical Security	8,000	7,225	4,797
Graded Security Protection Policy (formerly DBT)	10,000	0	0
Total, Operations and Maintenance (Homeland Security)	**720,823**	**667,954**	**711,105**
Construction (Homeland Security)	49,000	52,000	11,752
Total, Defense Nuclear Security	**769,823**	**719,954**	**722,857**

Outyear Funding Profile by Subprogram

(dollars in thousands)

	FY 2013	FY 2014	FY 2015	FY 2016
Defense Nuclear Security				
Operations and Maintenance (Homeland Security)				
Protective Forces	405,145	402,755	417,474	451,148
Physical Security Systems	129,491	130,266	132,872	140,537
Information Security	29,540	30,148	31,406	33,806
Personnel Security	39,063	39,375	39,862	41,205
Materials Control and Accountability	33,206	33,502	34,831	37,412
Program Management	86,706	86,363	92,631	103,527
Technology Deployment, Physical Security	6,644	6,764	7,034	7,332
Total, Operations and Maintenance (Homeland Security)	**729,795**	**729,173**	**756,110**	**814,967**
Construction (Homeland Security)	0	0	0	0
Total, Defense Nuclear Security	**729,795**	**729,173**	**756,110**	**814,967**

Cyber Security

Funding Profile by Subprogram

(dollars in thousands)

	FY 2010 Actual Appropriation	FY 2011 Request	FY 2012 Request
Cyber Security (Homeland Security)			
Infrastructure Program	99,838	97,849	107,618
Enterprise Secure Computing	21,500	21,500	14,000
Technology Application Development	2,000	4,996	4,996
Total, Cyber Security (Homeland Security)	**123,338**	**124,345**	**126,614**

Outyear Funding Profile by Subprogram

(dollars in thousands)

	FY 2013	FY 2014	FY 2015	FY 2016
Cyber Security (Homeland Security)				
Infrastructure Program	106,826	106,711	108,193	111,233
Enterprise Secure Computing	14,000	14,000	14,000	14,000
Technology Application Development	4,590	4,610	4,705	4,770
Total, Cyber Security (Homeland Security)	**125,416**	**125,321**	**126,898**	**130,003**

National Security Applications

Funding Profile by Subprogram

(dollars in thousands)

	FY 2010 Actual Appropriation	FY 2011 Request	FY 2012 Request
Operations and Maintenance	**0**	**20,000**	**20,000**
Total, National Security Applications	**0**	**20,000**	**20,000**

Outyear Funding Profile by Subprogram

(dollars in thousands)

	FY 2013	FY 2014	FY 2015	FY 2016
Total, National Security Applications	**20,000**	**20,000**	**20,000**	**20,000**

Weapons Activities

Congressionally Directed Projects
Funding Profile by Subprogram

	(dollars in thousands)		
	FY 2010 Actual Appropriation	FY 2011 Request	FY 2012 Request
Congressionally Directed Projects	**3,000**	**0**	**0**

Defense Nuclear Nonproliferation

Overview
Appropriation Summary by Program

(dollars in thousands)

	FY 2010 Actual Appropriation	FY 2011 Request	FY 2011 CR	FY 2012 Request
Defense Nuclear Nonproliferation				
Nonproliferation and Verification Research and Development	311,274	351,568		417,598
Nonproliferation and International Security	187,202	155,930		161,833
International Nuclear Materials Protection and Cooperation [a]	572,749	590,118		571,639
Elimination of Weapons-Grade Plutonium Production	24,507	0		0
Fissile Materials Disposition	701,900	1,030,713		890,153
Global Threat Reduction Initiative	333,500	558,838		508,269
Congressional Directed Projects	250	0		0
Total, Defense Nuclear Nonproliferation	**2,131,382**	**2,687,167**	**2,136,709**	**2,549,492**

Public Law Authorization:

Energy and Water Development and Related Agencies Appropriations Act, 2010 (P.L. 111-85)

National Nuclear Security Administration Act, (P.L. 106-65), as amended National Defense Authorization Act for Fiscal Year 2010 (P.L. 111-84)

Outyear Appropriation Summary by Program

(dollars in thousands)

	FY 2013	FY 2014	FY 2015	FY 2016
Defense Nuclear Nonproliferation				
Nonproliferation and Verification Research and Development	479,191	506,243	503,328	519,455
Nonproliferation and International Security	163,000	168,000	171,999	174,999
International Nuclear Materials Protection and Cooperation	519,000	633,000	656,000	531,723
Fissile Materials Disposition	1,112,877	963,691	991,657	1,071,940
Global Threat Reduction Initiative	497,000	637,000	661,000	740,278
Total, Defense Nuclear Nonproliferation	**2,771,068**	**2,907,934**	**2,983,984**	**3,038,395**

Nonproliferation and Verification Research and Development

Funding Profile by Subprogram

(dollars in thousands)

	FY 2010 Actual Appropriation	FY 2011 Request	FY 2012 Request
Nonproliferation and Verification R&D			
Proliferation Detection (PD)	175,813	225,004	218,350
Homeland Security-Related Proliferation Detection [Non-Add]	[50,000]	[50,000]	[50,000]
Nuclear Detonation Detection (NDD)	135,461	126,564	127,800
University of California Pension Payments and Contractor Pension Cost	0	0	71,448
Total, Nonproliferation and Verification R&D	**311,274**	**351,568**	**417,598**

Outyear Funding Profile by Subprogram

(dollars in thousands)

	FY 2013	FY 2014	FY 2015	FY 2016
Nonproliferation and Verification R&D				
Proliferation Detection (PD)	222,623	227,838	228,517	242,357
Homeland Security-Related Proliferation Detection [Non-Add]	[50,000]	[50,000]	[50,000]	[50,000]
Nuclear Detonation Detection (NDD)	139,568	145,405	145,811	154,098
University of California Pension Payments and Contractor Pension Cost	117,000	133,000	129,000	123,000
Total, Nonproliferation and Verification R&D	**479,191**	**506,243**	**503,328**	**519,455**

Nonproliferation and International Security

Funding Profile by Subprogram*

(dollars in thousands)

	FY 2010 Actual Appropriation	FY 2011 Request	FY 2012 Request
Nonproliferation and International Security			
Dismantlement and Transparency	72,763	49,207	0
Global Security Engagement and Cooperation	50,708	47,289	0
International Regimes and Agreements	42,703	39,824	0
Treaties and Agreements	21,028	19,610	0
Nuclear Safeguards and Security	0	0	53,925
Nuclear Controls	0	0	48,496
Nuclear Verification	0	0	46,995
Nonproliferation Policy	0	0	12,417
Total, Nonproliferation and International Security	**187,202**	**155,930**	**161,833**

* The Nonproliferation and International Security Program is proposing a budget structure change staring in FY 2012. The structure change creates a more efficient and clearer program organization with activities aligned along functional lines that reflect United States nonproliferation priorities and initiatives. The new structure depicts more clearly the alignment of people, technology, and resources to meet and implement nuclear nonproliferation objectives.

Outyear Funding Profile by Subprogram

(dollars in thousands)

	FY 2013	FY 2014	FY 2015	FY 2016
Nonproliferation and International Security				
Nuclear Safeguards and Security	56,038	57,757	59,132	60,163
Nuclear Controls	50,396	51,942	53,178	54,106
Nuclear Verification	43,662	45,001	46,073	46,876
Nonproliferation Policy	12,904	13,300	13,616	13,854
Total, Nonproliferation and International Security	**163,000**	**168,000**	**171,999**	**174,999**

International Nuclear Materials Protection and Cooperation

Funding Profile by Subprogram

(dollars in thousands)

	FY 2010 Actual Appropriation	FY 2011 Request	FY 2012 Request
International Nuclear Materials Protection and Cooperation			
Navy Complex	33,880	34,322	33,664
Strategic Rocket Forces/12th Main Directorate	48,646	51,359	59,105
Rosatom Weapons Complex	71,517	105,318	80,735
Civilian Nuclear Sites	63,481	59,027	59,117
Material Consolidation and Conversion	13,611	13,867	14,306
National Programs and Sustainability	68,469	60,928	60,928
Second Line of Defense	272,446	265,297	263,784
International Contributions [a]	699	0	0
Total, International Nuclear Materials Protection and Cooperation	**572,749**	**590,118**	**571,639**

Outyear Funding Profile by Subprogram

(dollars in thousands)

	FY 2013	FY 2014	FY 2015	FY 2016
International Nuclear Materials Protection and Cooperation				
Navy Complex	8,146	3,900	3,750	3,600
Strategic Rocket Forces/12th Main Directorate	42,014	6,150	5,900	5,650
Rosatom Weapons Complex	51,560	46,061	39,442	38,876
Civilian Nuclear Sites	48,292	44,249	46,996	46,996
Material Consolidation and Conversion	64,627	64,627	66,433	50,000
National Programs and Sustainability	39,006	39,006	41,734	39,006
Second Line of Defense	265,355	429,007	451,745	347,595
Total, International Nuclear Materials Protection and Cooperation	**519,000**	**633,000**	**656,000**	**531,723**

Elimination of Weapons-Grade Plutonium Production

Funding Profile by Subprogram

	(dollars in thousands)		
	FY 2010 Actual Appropriation	FY 2011 Request	FY 2012 Request
Elimination of Weapons-Grade Plutonium Production (EWGPP)			
Zheleznogorsk Plutonium Production Elimination (ZPPEP)	22,507	0	0
Crosscutting and Technical Support Activities	2,000	0	0
Total, Elimination of Weapons-Grade Plutonium Production (EWGPP)	**24,507**	**0**	**0**
Cancellation of unobligated balalnces			**-30,000**

Outyear Funding Profile by Subprogram

	(dollars in thousands)			
	FY 2013	FY 2014	FY 2015	FY 2016
Elimination of Weapons-Grade Plutonium Production	0	0	0	0

Fissile Materials Disposition

Funding Profile by Subprogram

	(dollars in thousands)		
	FY 2010 Current Appropriation	FY 2011 Request	FY 2012 Request
Fissile Materials Disposition (FMD)			
U.S. Surplus Fissile Materials Disposition			
Operations and Maintenance (O&M)			
U.S. Plutonium Disposition	91,659	278,940	274,790
U.S. Uranium Disposition	34,691	25,985	26,435
Supporting Activities	312	0	0
Subtotal, O&M	**126,662**	**304,925**	**301,225**
Construction	574,238	612,788	578,754
Total, U.S. Surplus FMD	**700,900**	**917,713**	**879,979**
Russian Surplus FMD			
Russian Materials Disposition	1,000	113,000	10,174
Total, Fissile Materials Disposition	**701,900**	**1,030,713**	**890,153**

Outyear Funding Profile by Subprogram

	(dollars in thousands)			
	FY 2013	FY 2014	FY 2015	FY 2016
Fissile Materials Disposition				
U.S. Surplus Fissile Materials Disposition (O&M)	422,575	480,280	531,134	686,135
Construction	637,802	430,661	402,773	354,805
Russian Surplus Fissile Materials Disposition	52,500	52,750	57,750	31,000
Total, Fissile Materials Disposition	**1,112,877**	**963,691**	**991,657**	**1,071,940**

Global Threat Reduction Initiative (GTRI)

Funding Profile by Subprogram

(dollars in thousands)

	FY 2010 Actual Appropriation	FY 2011 Request	FY 2012 Request
Global Threat Reduction Initiative			
Highly Enriched Uranium (HEU) Reactor Conversion	**102,772**	**119,000**	**148,269**
Nuclear and Radiological Material Removal			
Russian-Origin Nuclear Material Removal	94,167	145,191	147,000
U.S.-Origin Nuclear Material Removal	9,889	16,500	9,000
Gap Nuclear Material Removal	9,111	108,000	56,000
Emerging Threats Nuclear Material Removal	5,556	16,000	5,000
International Radiological Material Removal	8,333	45,000	20,000
Domestic Radiological Material Removal (Homeland Security)*	17,778	25,000	20,000
Subtotal, Nuclear and Radiological Material Removal	**144,834**	**355,691**	**257,000**
Nuclear and Radiological Material Protection			
BN-350 Nuclear Material Protection	9,109	2,000	2,000
International Material Protection	41,463	57,000	50,000
Domestic Material Protection (Homeland Security)*	35,322	25,147	51,000
Subtotal, Nuclear and Radiological Material Protection	**85,894**	**84,147**	**103,000**
Total, Global Threat Reduction Initiative	**333,500**	**558,838**	**508,269**

* Office of Management and Budget (OMB) Homeland Security designation.

Outyear Funding Profile by Subprogram

	(dollars in thousands)			
	FY 2013	FY 2014	FY 2015	FY 2016
Global Threat Reduction Initiative				
HEU Reactor Conversion	**175,000**	**230,000**	**254,000**	**269,000**
Nuclear and Radiological Material Removal				
Russian-Origin Nuclear Material Removal	112,000	110,000	105,000	100,000
U.S.-Origin Nuclear Material Removal	8,000	3,000	3,000	3,000
Gap Nuclear Material Removal	56,000	20,000	10,000	5,000
Emerging Threats Nuclear Material Removal	5,000	5,000	5,000	5,000
International Radiological Material Removal	20,000	20,000	25,000	25,000
Domestic Radiological Material Removal (Homeland Security)*	20,000	20,000	28,000	29,000
Subtotal, Nuclear and Radiological Material Removal	**221,000**	**178,000**	**176,000**	**167,000**
Nuclear and Radiological Material Protection				
International Material Protection	50,000	86,000	87,000	91,000
Domestic Material Protection (Homeland Security)*	51,000	143,000	144,000	213,278
Subtotal, Nuclear and Radiological Material Protection	**101,000**	**229,000**	**231,000**	**304,278**
Total, Global Threat Reduction Initiative	**497,000**	**637,000**	**661,000**	**740,278**

* Office of Management and Budget (OMB) Homeland Security designation.

Defense Nuclear Nonproliferation

Congressionally Directed Projects
Funding Profile by Subprogram

	(dollars in thousands)		
	FY 2010 Actual Appropriation	FY 2011 Request	FY 2012 Request
Congressionally Directed Projects	**250**	**0**	**0**

Naval Reactors

Overview
Appropriation Summary by Program

(dollars in thousands)

	FY 2010 Actual Appropriations	FY 2011 Request	FY 2012 Request*
Naval Reactors Development			
Operations and Maintenance (O&M)	877,533	997,886	1,069,262
Program Direction	36,800	40,000	44,500
Construction	30,800	32,600	39,900
Total, Naval Reactors Development	**945,133**	**1,070,486**	**1,153,662**

* FY 2012 includes $27,800 DoD support for the Expended Core Facility M-290 Receiving Discharge Station line-item construction project.

Public Law Authorizations:
P.L. 83-703, "Atomic Energy Act of 1954"
"Executive Order 12344 (42 U.S.C. 7158), "Naval Nuclear Propulsion Program"
P.L. 107-107, "National Defense Authorizations Act of 2002", Title 32, "National Nuclear Security Administration"
John Warner National Defense Authorization Act for FY 2007, (P.L. 109-364)
FY 2008 Consolidated Appropriations Act (P.L. 110-161)
National Nuclear Security Administration Act, P.L. 106-65), as amended
FY 2009 Consolidated Appropriations Act (P.L. 111-8)
FY 2010 Energy and Water Related Agencies Appropriation Act (P.L. 111-85)

Outyear Appropriation Summary by Program*

(dollars in thousands)

	FY 2013	FY 2014	FY 2015	FY 2016
Naval Reactors Development				
Operations and Maintenance	1,093,038	1,181,847	1,234,610	1,245,900
Program Direction	47,040	49,670	52,390	54,200
Construction	92,200	58,400	187,200	269,700
Total, Naval Reactors Development	**1,232,278**	**1,289,917**	**1,474,200**	**1,569,800**

* The annual totals include an allocation to NNSA from the Department of Defense's (DoD) Research, Development, Testing and Evaluation (RDT&E) account entitled: "NNSA Program Support." The amounts included for Naval Reactors from this DoD account are FY 2013,
$5.7 million; FY 2014 $1.7 million; and FY 2015 $0.4 million.

PREPARED STATEMENT DR. MICHAEL R. ANASTASIO

INTRODUCTION

Chairman Nelson and Ranking Member Sessions, I would like to thank you for your invitation to appear before the subcommittee on the "challenges and tasks confronting the laboratories in fiscal year 2012 and the out-years." I am pleased to appear today along with National Nuclear Security Administration (NNSA) Administrator Tom D'Agostino, Director for Naval Nuclear Propulsion Admiral Kirk Donald, Deputy Administrator for Defense Programs Dr. Don Cook, and my fellow laboratory directors from Lawrence Livermore and Sandia National Laboratories. I am currently in my 31st year in the weapons program and in my 9th year as a laboratory director, having served first as director of Lawrence Livermore and now since 2006 at Los Alamos (LANL). As you likely know, I will be retiring as director this summer, and I wanted to take this opportunity to thank this committee for all its support of the Laboratory and the NNSA mission over the years.

Los Alamos is one of the Nation's two nuclear weapons design laboratories. Although the Laboratory and its mission evolve over time, the primary focus of LANL remains to ensure the U.S. nuclear weapons stockpile is safe, secure, and effective. More broadly, Los Alamos is a national security science Laboratory. We conduct work in the national interest in a broad range of areas including nonproliferation, support to the intelligence community and homeland security, and energy security and the science that underpins all these mission areas.

Per the request of the subcommittee, I will focus my remarks today on the health and vitality of the Laboratory as it relates to our ability to meet the national security requirements of the Nation. Since I last appeared before the U.S. Senate in July 2010 much has happened here in Washington which will potentially have profound impacts on the future of Los Alamos. With the passage of the New START treaty last December and the preceding debate on the health of the United States' nuclear weapons complex and strategic stockpile, a baseline strategy was formed.

The administration announced a nuclear policy in the form of its Nuclear Posture Review (NPR) in April 2010 and a budget outline to support it, through the so-called 1251 Report, which was released in May 2010 and then updated later that year in November. Along with my colleagues from Livermore and Sandia, we issued a statement on the NPR in April, parts of which I include here: "We believe that the approach outlined in the NPR, which excludes further nuclear testing and includes the consideration of the full range of life extension option's (refurbishment of existing warheads, reuse of nuclear components from different warheads and replacement of nuclear components based on previously tested designs), provides the necessary technical flexibility to manage the nuclear stockpile into the future with an acceptable level of risk."

I addressed these issues further in my testimony before this Committee in July 2010, where I stated in general that I was encouraged by the policy, and I said further that I viewed, "the NNSA's fiscal year 2011 budget request as a positive first step . . . " However, I added that, " . . . I have concerns about sustaining the focus and an appropriate budget over the several decades for which it will be required." As I will discuss further in my testimony today, this continues to be a concern.

The three laboratory directors were once again asked our opinion of the updated 1251 Report, when it was released in November 2010. In response to a December 2010 letter from the Chairman and Ranking Member of the Senate Foreign Relations Committee, the three of us stated that "We are very pleased by the update to the 1251 Report, as it would enable the laboratories to execute our requirements for ensuring a safe, secure, reliable and effective stockpile under the Stockpile Stewardship and Management Plan." We continued further that, "We believe that, if enacted, the added funding outline in the Section 1251 Report update—for enhanced surveillance, pensions, facility construction, and Readiness in Technical Base and Facilities (RTBF), among other programs—would establish a working funding level for a balanced program that sustains the science, technology and engineering base."

I recognize, however, that in the interim, the country is now confronting some very significant financial challenges. My comments today recognize that situation and are cognizant that all Federal programs will be facing budget constraints in the months and years ahead.

HEALTH AND VITALITY OF THE LABORATORY IN SUPPORT OF THE NATIONAL MISSION

When I testified before the Senate last July, the focus of my remarks was on the ability of the Laboratory to execute the new national strategy based on the funding in the President's fiscal year 2011 budget submission. At the subcommittee's behest, I would like to outline what I believe are key elements for maintaining a healthy and vital Los Alamos, one that can support the national needs of the country. At the fundamental level, the Laboratory needs the best scientists, engineers, technicians and support staff that can work in multi-disciplinary teams on national security science challenges facing the country. In order for us to be able to attract and retain the best people, I believe that the following elements form a strong foundation for the Laboratory:

- A strong national commitment to compelling national security missions;
- Stable and adequate funding;
- Diverse and broad cutting-edge scientific programs, which attract the best and brightest scientific talent; and
- Tools, facilities and infrastructure to accomplish the above, such as: the Los Alamos Neutron Science Center (LANSCE), the proposed Matter Radiation Interactions in Extremes (MaRIE) facility, and exascale computing, among others.

If all the above elements are in place, the Nation will be able to reap the benefits of a healthy Los Alamos. As director, I am responsible to ensure that this is as true 15 years in the future as it is today, even though no one can predict what then will be the compelling challenges facing the country. I will address the current status of each of these elements below.

STRONG NATIONAL COMMITMENT TO COMPELLING NATIONAL SECURITY MISSIONS

The Obama administration in April 2010 released its NPR that updated the Nation's nuclear weapons policy. One of the five key objectives of the NPR was "sustaining a safe, secure, and effective nuclear arsenal." The NPR discussed that this would be accomplished by studying "options for ensuring the safety, security, and reliability of nuclear warheads on a case-by-case basis, consistent with the congressionally-mandated Stockpile Management Program. The full range of LEP [Life Extension Program] approaches will be considered: refurbishment of existing warheads, reuse of nuclear components from different warheads, and replacement of nuclear components." The NPR provided further detail on the fact that the "U.S. nuclear stockpile must be supported by a modern physical infrastructure . . . " and that the "science, technology and engineering base, vital for stockpile stewardship as well as providing insights for non-proliferation, must be strengthened."

The NPR was followed by a program plan and funding profile (the revised 1251 Report) with an accompanying request for substantial funding increases in the fiscal year 2011 and fiscal year 2012 budget submissions. These policies and plans commit the NNSA's national security enterprise to an aggressive body of work for the next 20+ years that includes completion of the current Life Extension Program (LEP) for the W–76, starting studies to complete LEPs of the B61, W78, and W88 and the construction of the Chemistry and Metallurgy Research Replacement facility (CMRR) at Los Alamos and the Uranium Production Facility (UPF) at the Y–12 plant.

The workforce at LANL is excited and energized to meet these challenges which are daunting. Certifying the stockpile in the absence of the ability to test (the last U.S. nuclear test was in 1992) has provided one of the greatest technical challenges to ever face the nuclear weapons complex and led to the creation of the science-based Stockpile Stewardship Program (SSP). At a high level, the SSP is critical both to the annual assessment of the stockpile, as well as to maturing the next generation of tools and technologies that will support certification of future LEPs. It requires powerful experimental capabilities to probe key questions facing an aging stockpile, as well as the most capable supercomputers in the world to integrate our new knowledge from experiments and validate this through comparison with the data that we have from our underground test history.

I want to stress that we have learned a great deal about the science and engineering of weapons and the detailed phenomena that have to occur for a weapon to function properly. Contrary to what some have argued, we are definitely not "done" with science—there are many significant areas of work that remain to be done. There are critical open questions that remain to be solved to retain our confidence in the stockpile, and we cannot fully predict the scientific challenges that are still ahead as it continues to age and goes through modernization. As a nuclear weapons enterprise, we need to be fully utilizing the tools of Stockpile Stewardship that are now online, ranging from the Dual Axis Radiographic Hydrodynamic Test (DARHT) facility and LANSCE at Los Alamos, to the National Ignition Facility (NIF) at Livermore.

We also need to continue what will likely be a decade long march to the next level of supercomputing performance, known as "exascale computing." One of the largest successes of Stockpile Stewardship has been our advances in supercomputing capability, and specifically our ability to model the complex phenomena that occur in a weapon. What we have discovered is that with each improvement in simulation performance, we see greater fidelity and develop an improved understanding, as well as a further awareness of what we still do not understand. Thus, moving to the next generation of computing is not a luxury or simply speed for the sake of speed. It is essential to our understanding of the challenges we face with the stockpile, in particular as we move further away from our underground test experience.

If funded according to the profile in the 1251 Report, this program of work constitutes national commitment to a compelling national security mission.

STABLE FUNDING

Stable funding is another sign to the workforce that there is a national commitment to the mission. In the national security science area and weapons activities in particular, scientists of necessity become involved in classified research and de-

velopment (R&D). Consequently, they disappear from the traditional forums of publication and conferences that lead to advancement in their fields and once out of sight it is very difficult to find opportunities to reenter this very competitive arena. Before forgoing this career path, scientists must judge if there is an opportunity for a career over several decades and the best of them have many other choices available. A national commitment and stable funding to go with it are essential elements to enable that personal decision.

For a laboratory like Los Alamos, stable funding allows institutional workforce planning to ensure that the right mix of skills with the right mix of experience are available to the programs to execute work today and into the future. With funding uncertainty and the associated worries about downsizing coupled with pay freezes, increased contribution to pension and medical plans, the best of our workforce is difficult to retain. Currently for Los Alamos, with the uncertainty in the fiscal year 2011 and fiscal year 2012 budgets, I don't know what actions I should be taking—increasing the size of the workforce or decreasing the size of the workforce.

BROAD AND DIVERSE SCIENCE PORTFOLIO THAT CAN ATTRACT THE BEST AND BRIGHTEST

Over the years, I have engaged the national leadership about my concern that the scientific capability that underpins the nuclear weapons program has been squeezed by eroding funding, increasing costs for facilities and security, and uncertainty over the future of the program. This squeeze has impacted our ability to advance the science to address the gaps in our understanding that must be closed for our continued confidence in the nuclear deterrent. For example, we have had to forgo some areas of research and have not fully utilized our major experimental facilities like DARHT, LANSCE, and NIF. Additionally, we have not consistently provided the most capable diagnostics and instruments for our research. It is the knowledge developed from this broad range of experimentation that is essential to validate our simulation tools that forms the basis for confidence through the science-based SSP.

In order to mitigate the consequences of these shortfalls in support for our scientific capabilities, we have consciously found funding from other sponsors that utilize some of the same science as that needed by the weapons program, and in that way sustain and enrich our capabilities that reside in the more than 2,500 Ph.Ds that are the core of our science base. For instance, our technical staff does work that is competitively selected for the Department of Energy's (DOE) Offices of Science and Nuclear Energy, and NNSA's Office of Nuclear Nonproliferation, that is, of course, very important in its own right. Our researchers fare well in these competitions as they are recognized as among the top scientists in the country, by numerous measures, including the number of peer-reviewed publications. These non-weapons programs serve to both attract top scientists to the Laboratory, and they also build up fundamental scientific capability that can then be further leveraged and applied to our core weapons program work.

In the case of Los Alamos, the intellectual seed corn has to be attracted and incentivized to join our staff because of our remote location and the heavy recruitment of U.S. citizens with technical degrees from large corporations and research universities. As a March 25, 2011, New York Times article highlighted, we have tough competition from today's Silicon Valley that can provide high salaries, stock options and free iPads to new recruits. The good news is that typically once we get the scientific talent to the Laboratory, they tend not to leave because of the diverse set of scientific opportunities we are able to offer. This is particularly true when our early-career scientists develop a better understanding of our national security missions in nuclear weapons, conventional explosives, materials research, radiography, intelligence activities, and actinide chemistry and plutonium science, to name just a few.

One common example of the path that many of our employees take from newly hired postdoctoral candidate to highly trained weapons engineer or designer can be found at our linear accelerator LANSCE. LANSCE is a DOE national user facility, the largest such facility at an NNSA site, as measured by the number of visits. LANSCE is a perfect microcosm of the overall Laboratory. The facility is a proton accelerator supported by NNSA. This single accelerator, however, among other things supports Office of Science-funded work at our neutron scattering facility (Lujan Center) and our isotope production facility; Weapons Activities work at a proton radiography center, as well as at the Weapons Neutron Research facility; and work for the Office of Nuclear Energy. A new physicist will be hired to do unclassified science at LANSCE on the fundamentals of materials, for instance, and then over time they have the opportunity to start working on elements of our classified national security activities. The people who remain in the program do so because they believe in its scientific challenge and importance.

This same underlying science that supports the weapons program is applied to other real national challenges, whether it is analyzing data from radiation detectors in Japan to help understand the status of the reactors and spent fuel rods or responding to the Gulf of Mexico crisis. For example, our staff experienced in radiography were able to immediately deploy to the Gulf of Mexico last year and quickly develop a new capability to x-ray the Deep Horizon blowout preventer. At more than a mile beneath the surface, we provided imagery using a sealed source to help national decisionmakers better understand what was occurring inside that device.

TOOLS, FACILITIES AND INFRASTRUCTURE

The Nation has invested billions of dollars over many decades in the scientific tools, facilities and infrastructure at Los Alamos. The reality, though, is that much of that infrastructure has aged, and more than 50 percent of our facilities are more than 40 years old. Los Alamos has been working closely with NNSA to build strategies that update the site's aging infrastructure.

A key element of that infrastructure, in terms of the required national capability, is the replacement facility for the Chemistry and Metallurgy Research facility that was completed in 1952 and was discovered years later to reside on a seismic fault. The CMRR will provide the infrastructure required for the Nation's ongoing plutonium work, just as the Uranium Production Facility (UPF) at Y–12 will provide the Nation's ability to work with uranium. The currently operating plutonium and uranium facilities have both served our country well over the last 60 years. However, with evolving safety and security standards, these aging buildings now need to be replaced with more efficient structures designed to meet modern-day requirements.

It is important to recognize, especially when I look at the overall health and vitality of the Laboratory, that the infrastructure needs at Los Alamos are much broader than just CMRR. Clearly, CMRR will be one of the biggest line-item projects in front of this subcommittee, but other smaller investments will be required that will help maintain the science at the Laboratory. One example of this is LANSCE. We have been working with this subcommittee, as well as with NNSA to ensure a path forward for the enhanced maintenance of this machine that supports not only NNSA's Defense Programs, but also our efforts with DOE's Offices of Science and Nuclear Energy. We have been charting a path with DOE and NNSA for the future of LANSCE and a follow-on materials science capability called MaRIE. As I discussed earlier, it is the broader set of science programs that enable us to attract the next generation of scientists. Absent these types of tools, we will be hard pressed to accomplish our recruitment goals.

CHALLENGES

We at Los Alamos, like most Americans, appreciate the significant fiscal constraints we are facing as a nation. However, I am increasingly concerned about the final outcome of the fiscal year 2011 budget process and whether proposed reductions below the 1251 baseline will be enacted, and if so, whether that will be a trend into fiscal year 2012 and beyond. At Los Alamos alone, the differential in funding shifts that may arise from the current debate in Congress amounts to the equivalent of 20 percent of our annual budget. Absorbing such a contraction beyond fiscal year 2011 would undoubtedly result in workforce actions, not to mention the destabilizing effect that would take years to correct.

Pressure from mounting pension requirements and on carryover balances have left very little flexibility remaining should our budget fall below the 1251 Report guidance. This concern is compounded, if not amplified, by the proposed funding reductions to the DOE's Science and Energy programs and NNSA's Nuclear Nonproliferation programs which would have significant negative impacts on the capabilities supporting the weapons program at Los Alamos, and the overall health of the Laboratory. As I discussed above, our research base is very broad, and we have significant crosscutting activity that provides additional support apart from the weapons program. A significant loss of funding in these areas will have impacts on our R&D workforce in the areas that the weapons program has not been able to fully support. It is the aggregate expertise and varied capabilities derived from multiple sources that comprise this great institution's technical strength in addressing issues of national importance.

In addition, the re-commitment to the nuclear weapons enterprise embodied in the NPR has, I believe, engendered a sense of stability and dedication in our workforce over the past year. To reverse course and curtail our modest hiring efforts at this point will result in losing that momentum and, I predict, will result in a drain of technical experts via retirements and the pursuit of careers in institutions that can offer that stability. I would offer that the people, infrastructure and science that

underlie our nuclear defense represent an expertise that warrants stability over the long term, independent of short-term fiscal constraints.

CONCLUSION

With all the turmoil and uncertainty in the world, now more than ever, the Nation needs a strong national defense. Los Alamos is proud of the contributions we have made for more than 65 years, providing innovative and effective science and engineering to confront a broad range of the country's evolving security challenges. For our nuclear deterrent, the Nation has a clear policy together with a program of work and a funding profile for its execution. Regrettably, at the same time, the Federal budget is under tremendous strain. The uncertainty in the budget process and its eventual outcome puts that policy and program, as well as the health of the Laboratory, at risk. The disconnect between the budget, on the one hand, and the policy and program on the other, leads to instability and the inability to ultimately meet the goals.

Los Alamos is prepared, as always, to do its very best to deliver on our missions with our most creative science and engineering. However, aligning the budget with a program balanced across near-term goals and the underlying science will be essential for success. If the budget cannot support the current program then the policy framework and program to carry it out must be revisited.

Mr. Chairman, I again want to thank you for the opportunity to come before the subcommittee and outline my concerns. I would be happy to answer any questions you might have.

PREPARED STATEMENT BY HON. GEORGE H. MILLER

OPENING REMARKS

Mr. Chairman and members of the subcommittee, thank you for your continuing support for the Nation's Stockpile Stewardship Program. I am George Miller, Director of the Lawrence Livermore National Laboratory (LLNL). We are one of the Department of Energy's (DOE) National Nuclear Security Administration (NNSA) nuclear design laboratories responsible for helping sustain the safety, security, and effectiveness of our strategic deterrent.

The Nation not only depends on the success of our efforts in stockpile stewardship but also leverages the capabilities of the NNSA Laboratories to develop innovative solutions to major 21st century challenges in nuclear security, international and domestic security, and energy and environmental security.

SUMMARY

- I believe that the program outlined in the President's budget request for fiscal year 2012 provides a measured approach to meeting the mission needs and sustaining the capabilities and deterrent value of the Nation's nuclear security enterprise through investments in a skilled, knowledgeable, and able workforce; advanced scientific facilities and production facilities; and a safe, secure, and effective stockpile.
- The tools of stockpile stewardship are being effectively applied to assess and, where necessary, refurbish and sustain our Nation's nuclear deterrent. Your investment in "flagship" capabilities in high-performance computing and the National Ignition Facility at LLNL are producing excellent results.
- It is important that we continue to move forward with refurbishing the aging stockpile. The inevitable changes that we detect through our surveillance and assessment programs increase risk with every year and must be mitigated. In particular, it is imperative that we begin the study of options for refurbishing the W78 warhead to address evolving issues identified in the annual assessment of this weapon system.
- High-performance simulations accomplished using the tools available today have demonstrated that still unresolved issues will require exascale-level computing to continue to stay on top of the stockpile concerns and challenges ahead. Achieving exascale computing is a technically challenging endeavor, similar to the effort in the 1990s to develop terascale computing. This new capability will have other positive impacts on our country's national security and competitiveness. I am pleased that a program to initiate this effort is included in the President's budget request and strongly urge support for an aggressive research and development effort to create the technologies necessary to achieve and apply exascale computing.

• The science, technology, and engineering capabilities that are the foundation of the Stockpile Stewardship Program and the core capabilities of the NNSA Laboratories have been successfully leveraged to help solve some of the country's most important and urgent issues in defense, energy, and environment.

• The national investment in the Stockpile Stewardship Program has produced impressive science, technology, and engineering capabilities at the NNSA Laboratories that should be carefully nurtured and preserved. However, like all treasures, if these assets are neglected, they and the key personnel that we rely on will disappear very quickly. I believe that they deserve your careful consideration as the country faces both very difficult budget decisions and a challenging future in a dangerous world.

INTRODUCTION

I am here to provide my technical assessment of the NNSA weapons program activities as outlined in the President's fiscal year 2012 budget request and of the ability of our Laboratory to sustain capabilities and fulfill mission requirements. The request reflects the need to deal with an aging stockpile and ensure the long-term health of the Nation's nuclear security enterprise by making substantial investments in a skilled workforce, facilities, and life-extension program activities. My testimony will focus on activities at Livermore and the importance of the budgeted investments to allow our Laboratory to accomplish the missions assigned to us. Without a healthy nuclear security enterprise, the Nation puts in jeopardy the safety, security, and effectiveness of the nuclear deterrent over the long run as well as the ability of the NNSA Laboratories to apply outstanding science, technology, and engineering to a wide range of important national security challenges.

The Nation's nuclear security strategy requires a stable and measured Stockpile Stewardship Program that is supported by the long-term commitment of successive administrations and Congress with sufficient funding to meet mission requirements. The President's proposed budget increase reverses the declining trend of the last several years and restores funding to a level sufficient to reinvigorate and sustain the Nation's program. These investments are urgently needed—in the face of enormous overall budget pressures—in all three major areas of stockpile stewardship: (1) life extension programs; (2) modernization of facilities and infrastructure; and (3) the science, technology, and engineering base. In my view, delays in providing adequate funding has both immediate, short-term consequences and raise longer-term sustainment issues.

LIFE EXTENSION PROGRAMS

It is very important that we address the specific issues discovered in our aging stockpile through the surveillance program and the review processes supporting our annual assessments before these concerns worsen. The role of any Life Extension Program (LEP) is to fix issues that impact—or will soon impact—overall system effectiveness and take actions that will extend the stockpile life. Failure to address these issues can have immediate and drastic consequences for the viability of the deterrent our national security strategy relies on.

Included in the request is funding for the Life Extension Study of the W78 Air Force Minuteman III ICBM warhead. This effort is vitally needed. $26 million was requested in fiscal year 2011 to begin a 6.1 Phase study to identify and evaluate the LEP. I am concerned because the start of the 6.1 Phase study has been delayed. In fiscal year 2012, the administration requested $51 million to continue W78 LEP development in the 6.2/6.2A Phase (feasibility, planning, and costing studies). The official NNSA guidance designates LLNL as the lead nuclear design laboratory for the W78 LEP.

It is important to begin the study activities on the W78 warhead because today it constitutes the majority of the ICBM leg of the triad and it has been deployed on the Minuteman III for more than 31 years. The warhead is currently beyond its planned service life and it will take a 10-year effort to study and then refurbish the necessary systems. We need to address concerns identified in surveillance of W78 units and reported in annual assessments. There are issues with material aging and compatibility, which can impact components within the nuclear explosive package. Los Alamos National Laboratory (LANL) has been monitoring W78 aging characteristics and has assessed that aging "has not affected the safety, reliability, or performance of the W78 to date;" however, "the condition is progressive and beyond current predictive capabilities." LLNL has concurred with these concerns in our peer review role as part of the annual assessment process. An important function of the study is to evaluate the different approaches available to refurbish the warhead—

as were outlined in the Nuclear Posture Review—and assess the impacts of including additional safety and security features.

MODERNIZATION OF FACILITIES AND INFRASTRUCTURE

Infrastructure modernization projects account for the largest portion of the proposed budget increase, and two of the projects are particularly high in cost and high in priority: the Chemistry and Metallurgy Research Replacement Nuclear Facility at LANL and a new Uranium Processing Facility at the Y–12 Plant in Oak Ridge, TN. I fully support these modernization projects and urge that as the cost baselines are further defined, any cost changes that occur be accommodated without upsetting the overall delicate balance of the Stockpile Stewardship Program.

SCIENCE, TECHNOLOGY, AND ENGINEERING BASE

The fiscal year 2012 President's budget request for science, technology, and engineering capabilities is, in my view, prudent but constrained and austere: the level of activity will be less than that in fiscal year 2007. This level of capability provides the fundamental stockpile stewardship activities that permit surveillance, assessments, experiments, and computer simulations to ensure the aging stockpile and the refurbished weapons are safe, secure, and effective.

Weapons Surveillance

Weapons surveillance activities aim to predict and detect the effects of aging and other stockpile issues. The programmed increase in funding is vitally needed to step up the rate of stockpile surveillance and become more proficient at detecting and predicting potential problems early enough for our smaller complex to take measured action within limited resources. This area has suffered over the last few years and more sophisticated tools are needed to study how aging alters the physical characteristics of weapon materials and how these changes affect weapon effectiveness and safety.

Assessments

The Stockpile Stewardship Program includes a comprehensive set of activities to annually assess each weapon system and to address issues that arise. It is particularly important for processes to actively engage both centers of nuclear design expertise—LLNL and LANL—to provide independent assessments. In all areas of importance, advice from more than one independent source is crucial to the decision-making process. Our assessments require rigorous scientific and engineering demonstration and evaluation and are benefiting from the development of Uncertainty Quantification, a methodology that is increasing the rigor of weapon certification and the quality of annual assessments.

Experiments and Simulations

Because we do not perform nuclear tests, simulations are a major tool for providing assessment of the stockpile. These simulations require experimental validation, which in the absence of nuclear testing, is provided by very sophisticated non-nuclear experiments. Through these experiments and simulations, Laboratory scientists and engineers improve their understanding of nuclear weapon performance and exercise the necessary base of specialized skills in support of stockpile stewardship.

There remain several key areas, such as energy balance and boost physics, where we still lack adequate knowledge. Predictive Capability Framework campaigns utilize our advanced stockpile stewardship tools to fill gaps in knowledge about nuclear weapon performance relevant to existing or expected issues about stockpiled weapons. These activities integrate the use of state-of-the-art high-performance computers, high-fidelity simulation models, and data gathered from state-of-the-art experimental facilities. This cutting-edge research provides both the basis for stockpile stewardship and the tools by which the Laboratory experts make judgments about the health, safety, security, and effectiveness of the stockpile.

Overall, LLNL conducts a wide range of experiments in support of the Stockpile Stewardship Program. For example, to enhance weapons surveillance, we developed and applied state-of-the-art radiographic methods to evaluate the health of the high-explosive system used to initiate weapon detonation. In fiscal year 2010 we also conducted important hydrodynamics experiments at the Contained Firing Facility at LLNL and at the Dual-Axis Radiographic Hydrodynamics Test Facility at LANL and many types of experiments to better understand material properties at extreme conditions. These include experiments at the National Ignition Facility.

I will focus on high-performance computing and activities at the National Ignition Facility, which illustrate the outstanding work at our Laboratory in support of

stockpile stewardship and the challenging science and technology efforts required for the Stockpile Stewardship Program.

HIGH-PERFORMANCE COMPUTING AND SIMULATIONS

Since the Stockpile Stewardship Program began in 1985, the NNSA weapons laboratories—working closely with industry—have made remarkable strides in high-performance computing. Our initial goal was to have a machine that could perform 100 trillion floating point operations per second (teraflops) available within a decade. Through a very concerted effort, the community achieved that goal, which provides the capability projected to be the minimum threshold for initial 3D simulations of weapons performance. With simulations on the 100-teraflops IBM Purple, we observed important phenomena that had never been seen before. We also learned that to accurately simulate these phenomena we needed supercomputers that perform much better and modeling techniques that are significantly more powerful and capable.

Computer technology has since advanced by about a factor of 10 (1,000 teraflops or 1 petaflops). Currently China leads the world with a 2.5-petaflops machine. The expanding international interest in supercomputing superiority is indicative of the technology's great value in advancing science and technology on many fronts and accelerating product development in industry.

Improved high-performance computing capabilities are to better meet stockpile stewardship challenges. To better understand phenomena in areas such as boost, improvements in both the physics models and resolution are required. Model improvements, in turn, necessitate further advances in computing: 1,000-petaflops technology (1 exaflops) is required. Exascale computing is also needed to fully implement Uncertainty Quantification, the formal methodology to increase the rigor of LEP weapon certification and the quality of annual assessments. The methodology requires thousands of three-dimensional weapon simulations to be run to estimate uncertainties. Simulations with today's capability tell us that we need better resolution, better physics models, and the running of many more simulations than possible with today's machines to reach the level of understanding and analysis required to fulfill mission needs.

Sequoia

Through the NNSA ASC program, Livermore and IBM are poised to make the next major advance in supercomputing. Delivery of the 20-petaflops IBM Sequoia is to begin in December 2011. Sequoia's processing speed is equivalent to every person on Earth completing 3 million calculations per second. This nearly-factor-of-10 leapfrog advance over current capabilities is based on third-generation IBM BlueGene technology. Unclassified science calculations will be performed on Sequoia in 2012, transitioning after these tests to classified use in 2013.

Since 2009, researchers have been using Dawn, a 500-teraflops initial delivery system for Sequoia. All three NNSA Laboratories run cutting-edge weapons science problems on Dawn and use the machine to prepare codes for use on Sequoia. For example, LANL performed the largest ever high-resolution turbulence simulations and uncovered new phenomena related to important open questions. The results are being used to improve physics models under development within Advanced Simulation and Computing. Sandia has been testing and improving the speed at which some of the key algorithms in their large simulation codes will run on Sequoia's 1.6 million processors.

Among other applications, LLNL scientists are developing new tools on Dawn to study complex laser-plasma interactions and to predict and interpret the results of experiments at the National Ignition Facility. More generally, in preparation for Sequoia's arrival, we are making significant progress in the development of algorithms that will run efficiently on the machine's architecture, applications that are tolerant to the many "faults" that can be expected in long runs using over a million processors, tools to analyze and help balance the workload among processors, debugging methodology, and a variety of data visualization and interpretation tools.

Exascale Initiative

I am very pleased to note that the fiscal year 2012 President's budget request includes $126 million to support start of an exascale initiative in an effort to sustain U.S. leadership in supercomputing to support DOE/NNSA missions. This is a joint effort between NNSA and DOE's Office of Science. The path forward beyond the 20-petaflops IBM Sequoia toward exascale computing offers exciting opportunities to address a wide range of vital national needs, but it presents tremendously difficult technical challenges. We are working with DOE and NNSA leadership, other laboratories, and industry to size and scope the technical work program.

THE NATIONAL IGNITION FACILITY

The National Ignition Facility (NIF) is the world's premier laser facility. Since the facility's dedication in May 2009, NIF with its 192 laser beams has performed exceptionally well. It is proving to be a remarkably reliable and precise system. Citing groundbreaking technical achievement and exemplary project management, the Project Management Institute (PMI) named NIF as the 2010 Project of the Year. PMI honored NIF for "pushing beyond the state-of-the-art" and lauded the effort as "a stellar example of how properly applied project management excellence can bring together global teams to deliver a project of this scale and importance efficiently."

NIF is the focal point for the National Ignition Campaign (NIC). The purpose of NIC is to determine the feasibility of fusion ignition and transition NIF from a construction project to routine experimental operations for weapons and basic science by the end of fiscal year 2012. With respect to fusion, NIC has two major goals: execution of DT ignition experiments starting in fiscal year 2010 for the purpose of demonstrating ignition and development of a reliable, repeatable ignition platform for weapons physics, basic science, and energy research by the conclusion of NIC at the end of fiscal year 2012. A national program, NIC includes as partnering institutions the three NNSA Laboratories, the University of Rochester Laboratory for Laser Energetics, and General Atomics. The NIC team has established collaborations with the Atomic Weapons Establishment in United Kingdom, Commissariat & l'Energie Atomique in France, Massachusetts Institute of Technology, Lawrence Berkeley National Laboratory, and many others.

The campaign is guided by the NIC Execution Plan (currently, NIC EP Revision 4), which describes the scope, schedule, and budget for the campaign. NIC is an exceedingly complex, frontier science and engineering project. Adjustments to the optimal path forward are made based on information learned from experiments. Accordingly, NIC accomplishments and plans are scrutinized by several external high-level committees: the NNSA Ignition Review Panel chaired by DOE Undersecretary for Science Steve Koonin, the NIC Technical Review Committee chaired by former Oak Ridge National Laboratory Director Al Trivelpiece, and the LLNL Directorate Review Committee chaired by former NNSA Administrator General John Gordon, USAF, Ret. The NIC reviews have been very positive and encouraging.

The Ignition Campaign

There have been a number of important successes at NIF. In the hohlraum energetics campaign, the NIC team demonstrated that the interaction between the laser beams and the target could be satisfactorily controlled and that the conditions necessary to implode the hydrogen fuel could be achieved. Creation of the proper implosion conditions was a major concern of the original National Academies of Science Study that led to the construction of NIF.

We have also demonstrated the integration of all of the subsystems needed for ignition. Cryogenically cooled ignition targets with a layer of solid tritium, hydrogen, and deuterium have been successfully created and imploded. One shot in particular achieved a record-setting 1.3 x 1014 neutrons in a purposely low-yield configuration.

NIC continues to make excellent progress and the results of implosion experiments are very encouraging. We continue to learn much from the experiments and see no "show stoppers." We are optimistic about success in achieving fusion ignition but mindful that NIC is an extremely challenging undertaking that is at the frontiers of science and technology. Current plans are to complete the current fusion ignition and burn campaign in spring or summer of 2012.

Stockpile Stewardship and Science Experiments

In late February-March 2011, we conducted the most recent series of highly successful campaigns of high-energy-density physics experiments in support of stockpile stewardship on NIF. One campaign focused on radiation transport to gather data to validate the capability of our physics simulation codes to model phenomena very important to weapon performance. Altogether, 16 experiments were performed in 11 shot days. These included the first experiments performed that included diagnostics to provide time-resolved radiographic data. Preliminary comparisons of data taken are in reasonable agreement with pre-shot predictions. A second campaign focused on developing and using a technique for gathering equation-of-state data to characterize the properties of highly compressed (but unheated) materials—in this case, tantalum and carbon. Gathered data from such experiments are needed for scientific advances that underpin both stockpile stewardship and planetary science. These experiments are important steps on the path toward transforming NIF to a national and international user facility in fiscal year 2013.

NUCLEAR NONPROLIFERATION AND COUNTERTERRORISM

A key aspect of our nuclear security efforts is applying our expertise in nuclear weapons science and technology, nuclear sensors and detection, and arms control verification technologies to programs in the NNSA Office of Defense Nuclear Nonproliferation. For example, to help secure vulnerable weapons-useable and radiological materials, Livermore-led teams have been recovering radioisotopic thermonuclear generators, which contain highly radioactive heat sources, from remote areas of Russia. Additionally, we are developing advanced technologies to detect nuclear and radiological materials. Two of the technologies received R&D100 Awards, the Oscars of invention, in 2010. Complementing these efforts is a program focused on nuclear counterterrorism.

The Laboratory provides both technical support to ongoing arms control negotiations and technology development. Livermore's underground nuclear explosion monitoring program is a longstanding nonproliferation program that provides the technical underpinning for both the domestic and international monitoring needed to uncover clandestine underground nuclear tests. We couple data from global seismic networks with LLNL's supercomputing capability to interpret the seismic data and model the earth, thereby improving U.S. capability to detect possible proliferation. This program also has strong links to international seismic safety and science engagement activities.

IMPORTANCE OF PEOPLE AND PROGRAM GROWTH TO THE HEALTH OF STOCKPILE STEWARDSHIP

Long-term success in stockpile stewardship fundamentally depends on the quality of people in the program. If the Nation is not confident in the expertise and technical judgments of the stewards, the Nation will not have confidence in the safety, security, and effectiveness of our nuclear deterrent. The specialized technical skills and expertise required for nuclear weapons work take a long time to develop through hands-on experience and mentoring by our very best. Program stability—based on sustained bi-partisan support and sufficient funding over the long term—is critically important to executing a balanced, integrated Stockpile Stewardship Program. We welcome the support provided by the administration and Congress on the importance of the NNSA Laboratories' work in maintaining the U.S. nuclear deterrent.

Program Leverage

An important benefit of a strong Stockpile Stewardship Program is that this foundational program enables the NNSA Laboratories to meet broader national security objectives by applying their unique capabilities and multidisciplinary approach to problem solving. With a focus on national security, the NNSA Laboratories are a vital part of the Nation's science and technology infrastructure. We partner with non-NNSA components of DOE, the Department of Defense, the Intelligence Community, the Department of Homeland Security, and many other agencies such as the National Aeronautics and Space Administration and the National Institutes of Health. In particular, nuclear weapons expertise at LLNL is directly applicable to the nuclear security challenges of proliferation and terrorism. Other areas of national defense, domestic and international security, and energy and environment security also benefit from the Laboratory's broad scientific and technical base and international leadership in areas such as high-performance computing.

These activities also further strengthen our science and technology workforce, add vitality to the Laboratory, and spin new ideas and additional capabilities into and out of the weapons program and other national security programs. Very importantly, they serve as a pipeline to bring top talent to LLNL so that we continue to provide the Nation with outstanding stockpile stewards. A broader base of national security programs at the NNSA Laboratories can never be a substitute for a strong Stockpile Stewardship Program. Likewise, these programs are not a distraction from our defining mission and responsibilities to sustain the Nation's nuclear deterrent.

Continuing to foster partnerships between Livermore and the broader national security community is a key component of our strategy for helping solve the country's most important problems and sustaining science and technology excellence and intellectual vitality at the Laboratory. I am very concerned about the possibility of drastic reductions in the investments in science and technology broadly across Federal departments and agencies in these times of very constrained budgets. Investments in science, technology, and engineering provide an important spark of innovation that is a basis for our country's national security, energy and environmental security, and continuing economic competitiveness.

Leveraging High-Performance Computing

I emphasize the importance of high-performance computing in my testimony because it is a cornerstone of the Stockpile Stewardship Program, a core strength of our laboratory, and critical to many of our programs for non-weapons-program sponsors. Some of our recent accomplishments provide a sense of the breadth of our high-performance computing activities and the many program areas they support:

- Support in response to environmental emergencies. The DOE's National Atmospheric Release Advisory Center (NARAC) at LLNL is providing timely, state-of-the-art, predictions of fallout from the damaged nuclear reactors after the recent earthquake/tsunami in Japan. As the hub of the Department of Homeland Security's Interagency Modeling and Atmospheric Assessment Center (IMAAC), NARAC also provided plume predictions of the fire on the Deepwater Horizon oil platform and forecast the particulates that might be released from surface-oil burns.
- Persistent surveillance. Laboratory scientists developed an innovative data-processing "pipeline" designed to help the Department of Defense monitor tens of square kilometers of terrain from the skies and provide combat support by detecting in real time potentially important events in streaming video data.
- Third-generation conventional munitions. LLNL is using state-of-the-art engineering codes, advanced design capabilities, and expertise in materials to pursue, with the Department of Defense, development of third-generation munitions that are more effective against precision targets while, at the same time, limiting collateral damage. This effort represents a superb example of the power of high-performance simulation: a munitions program went from concept to completion of qualification testing in 10 months, providing significant advantages to the warfighter.
- Nuclear test monitoring. Laboratory seismologists developed improved 3D models of seismic wave travel time, greatly increasing the accuracy with which seismic events can be located and the ability to differentiate earthquakes and nuclear explosions.
- Cyber security and intelligence support. Livermore has developed advanced methods for gleaning information from extremely large-scale relational databases (graphs) and analyzing networks together with fast, accurate tools for large-scale text analysis.
- Microbial detection. Expertise in bioinformatics enabled Laboratory researchers to develop microbial detection array with 388,000 probes that fit on a glass slide, able to detect or identify more than 2,000 viruses and 900 bacteria within 24 hours.
- Aerodynamic drag reduction for semi-trailer trucks. Simulations with LLNL's fluid dynamics codes identified critical drag-reduction regions around semi-trailer trucks, with results verified by full-scale wind tunnel tests. Properly placed drag reduction devices could increase semi-trailer truck fuel efficiency by as much as 12 percent.
- Award-winning software tools. Livermore researchers have developed advanced tools—including several R&D100 Award winners—for solving linear equations, debugging and compiling programs, and visualizing extremely large data sets that are made available to and downloaded thousands of times per year by the user community.
- Fusion energy. New developments at LLNL in lasers and materials technologies could provide a much shorter path to carbon-free energy.
- Directed energy. Laboratory researchers are developing exciting new capabilities in lasers that could have important impacts on national security.
- Carbon capture. Laboratory scientists are using supercomputers to design small-molecule catalysts that can be adapted to capture CO2 from power-plant emissions.

CLOSING REMARKS

Again, I thank the subcommittee for its continuing support for the Nation's Stockpile Stewardship Program and the terrific people at the LLNL. As I have stated, I believe that the program outlined in the President's budget request for fiscal year 2012 provides a measured approach to meeting the mission needs and sustaining the long-term health of the Nation's nuclear security enterprise through investment in a skilled workforce, facilities, and the stockpile.

The investments will help us move forward refurbishment programs in response to inevitable changes in aging weapons that require our attention. In particular, ini-

tiating the study of the options for refurbishing the W78 warhead is urgently needed.

The heart of our successful Stockpile Stewardship Program is our skilled workforce, who are the current generation of a worthy line of stewards in the service of our Nation. I have emphasized the importance of investing in the workforce and the tools that Laboratory scientists and engineers are effectively applying to assess and refurbish the nuclear deterrent. Our accomplishments in the areas of NIF experiments and high-performance computing are particularly noteworthy. In both areas, future opportunities are very exciting, and in particular, I urge that the Nation undertake a forceful effort in exascale computing because of its importance to stockpile stewardship and, more broadly, the Nation's security and economic future.

With sustained support for the Stockpile Stewardship Program, our Laboratory can best serve the country as a broad-based national security laboratory, developing innovative solutions to major 21st century challenges in nuclear security, international and domestic security, and energy and environmental security.

PREPARED STATEMENT BY DR. PAUL J. HOMMERT

INTRODUCTION

Chairman Nelson, Ranking Member Sessions, and distinguished members of the Senate Armed Services Subcommittee on Strategic Forces, thank you for the opportunity to testify. I am Paul Hommert, President and Director of Sandia National Laboratories. Sandia is a multiprogram national security laboratory owned by the U.S. Government and operated by Sandia Corporation [1] for the National Nuclear Security Administration (NNSA).

Sandia is one of the three NNSA laboratories with responsibility for stockpile stewardship and annual assessment of the Nation's nuclear weapons. Within the U.S. nuclear weapons complex, Sandia is uniquely responsible for the systems engineering and integration of the nuclear weapons in the stockpile and for the design, development, and qualification of nonnuclear components of nuclear weapons. While nuclear weapons remain Sandia's core mission, the science, technology, and engineering capabilities required to support this mission position us to support other aspects of national security as well. Indeed, there is natural, increasingly significant synergy between our core mission and our broader national security work. This broader role involves research and development in nonproliferation, counterterrorism, energy security, defense, and homeland security.

My statement today will provide an update since my testimony of July 15, 2010, before the Senate Armed Services Committee. Starting from an overall perspective of the nuclear weapons program and the challenges facing us since the beginning of the Cold War, I will refer to the following major issues: (1) the U.S. nuclear stockpile assessment, (2) the life extension programs (LEPs) with emphasis on the B61 LEP, and (3) the status of the capability base needed to support our mission. All these issues will be viewed within the context of the administration's request to Congress for the fiscal year 2012 budget.

MAJOR POINTS OF THIS TESTIMONY

1. It is my view that we are now entering a new era for the U.S. nuclear deterrent. The nuclear weapons enterprise must address for the first time the following three imperatives: continuing to further the tools of stewardship, upgrading production infrastructure, and importantly, modernizing the nuclear stockpile. Such an environment creates funding demands not seen in recent decades, and it will require rebalancing the program, along with continued emphasis on strong program management.

2. The most immediate stockpile challenge is the B61 life extension. In the context of my responsibilities, it is my judgment that the full nonnuclear scope of the B61 must be executed on the proposed schedule. Both the current scope and the schedule are demanding and can be achieved only by continuing the accelerating effort called for by the current program.

3. Our nuclear weapons competencies impact our broader national security work. In turn, to sustain and sharpen those competencies, Sandia relies on this broader work. The symbiotic relationship between the nuclear weapons and broader national security missions prevents insularity and creates a challenging, vigorous scientific

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[1] Sandia Corporation is a subsidiary of the Lockheed Martin Corporation under Department of Energy prime contract no. DE–AC04–94AL85000.

and engineering environment that attracts and retains the new talent that we need. Such an environment is essential to succeed against the challenges we now face.

PERSPECTIVE OF THE NUCLEAR WEAPONS PROGRAM

It is my view that we are now entering a new era for the U.S. nuclear deterrent. The nuclear weapons enterprise must address for the first time the following three imperatives: continuing to further the tools of stewardship, upgrading production infrastructure, and importantly, modernizing the nuclear stockpile. Such an environment creates funding demands not seen in recent decades, and it will require rebalancing the program, along with continued emphasis on strong program management. Our nation has been and continues to be fully committed to the U.S. nuclear deterrent as reflected by the near- and long-term nuclear weapons policy outlined in the National Posture Review (April 2010). The contribution of Sandia National Laboratories is crucial to the success of the next era of the U.S. nuclear deterrent.

The current nuclear stockpile was largely developed, produced, and tested in the 1970s and 1980s, during the Cold War. It was the time of the arms race, as new nuclear systems were frequently being developed and fielded.

After the 1992 moratorium on underground testing, the nuclear weapons program went into its next phase, science-based stockpile stewardship. For the first 15 years of this program, creating the scientific tools and knowledge required in the absence of underground nuclear testing was a compelling grand challenge for the U.S. nuclear weapons program. At Sandia, the primary challenge following the moratorium was to find best solutions for sustaining, assessing, and certifying the stockpile against a full range of environments—most notably, the numerous radiation environments our products must survive. The advanced tools and deeper scientific understanding we developed have been applied to our annual assessment of the stockpile, to stockpile maintenance activities such as replacement of limited-life components, and to the qualification of the W76–1 life extension program. Science-based stockpile stewardship has been immensely successful in generating the required scientific competencies and resources, but it was not accompanied by a broad-based effort to extend the lifetime of the nuclear arsenal.

Now, some 20 years since the end of the Cold War, we have a stockpile that has become significantly smaller and older. Considering our insights into and the average age of the stockpile, we have clearly reached a point at which we must conduct full-scale engineering development and related production activities to extend the service life of the nuclear arsenal. This work can be accomplished only by relying on the tools of stewardship and a revitalized, appropriately sized production capability. Let me restate that, in my view, the nuclear weapons enterprise has never before faced the combined need to further stewardship, address production infrastructure, and importantly, modernize the stockpile.

As we enter the new era of the nuclear deterrent, I am pleased to see that a clear strategic direction has been outlined for U.S. nuclear weapons policy in the Nuclear Posture Review and that a collective guidance for implementation has been provided through the Stockpile Stewardship and Management Plan, the updated section 1251 report, and the administration's fiscal year 2012 budget request to Congress. The strategic direction for the nuclear weapons policy is also consistent with the New START, which was ratified by the U.S. Senate in December 2010 and the Russian Federation Duma in January 2011. In this context, we are actively positioning Sandia to fulfill its responsibilities in support of the Nation's nuclear deterrent. We are confident in our ability to do so.

In their totality, the documents describing the future of the U.S. nuclear deterrent represent a well-founded, achievable path forward, which I understand and support. However, we must recognize that a significant body of work is required to sustain a strong nuclear deterrent into the next two decades, and we must ensure that the resources are commensurate with the requirements and expectations. Specifically, I can be confident that, as an institution, we are positioned to execute stockpile management and deterrence policy to the priorities delineated in the policy documents referred above if the fiscal year 2011 budget is appropriated at the level of the administration's request. Furthermore, the overall fiscal year 2012 weapons activities budget, if authorized and fully appropriated as requested by the President, will provide the basis for continuing the program consistent with national policy. This level of funding reflects a national commitment to strengthening the security of our country and allies by sustaining a smaller nuclear stockpile that is safe, secure, effective, and reliable. Deviation from this funding, however, will impact the scope and/or schedule of the life extension programs.

THE U.S. NUCLEAR STOCKPILE ASSESSMENT

Mission and Product Space

Sandia is responsible for the systems engineering and integration of the nuclear weapons in the U.S. stockpile, and it is the nonnuclear component design agency for NNSA. The components that we design ensure that the weapons will perform as intended when authorized through the U.S. command and control structure, and that they remain safe and secure otherwise. These critical functions are provided through our core products of arming, fuzing, and firing systems (AF&Fs), neutron generators, gas transfer systems, and surety systems. As we prepare to execute these responsibilities for 21st century strategic deterrence, we are facing new challenges.

While many critical tools were developed in the stewardship era, full-scale engineering development was almost entirely absent during this period. In addition, since we last put a system such as the B61 into the stockpile, the technologies on which nonnuclear components rely have changed dramatically. Thus we must ensure that a new generation of component and system engineers is prepared to work to the exacting standards of nuclear weapons and that we can fully adapt to and take advantage of new technologies. I am confident that Sandia is prepared to meet these challenges due in no small measure to the fact that, over the past 20 years, work we have done in other national security arenas has allowed us to attract and train the talent that will bring new technology to high-consequence high-reliability engineering applications. In the decade since we began design on the W76–1 LEP, one additional challenge has grown in complexity. Sandia's products must also be robust against cyber risk. We believe it is vital to assess cyber risk and develop technologies to manage this risk for the next generation of life extension programs. All these realities bear directly and significantly on Sandia's responsibilities as we embark on the next era of the nuclear deterrent.

Stockpile Surveillance and Assessment

Stockpile surveillance and assessment play a crucial role in assuring the nuclear deterrent. Through these activities, we develop knowledge about the safety, security, and reliability of the stockpile. This knowledge provides the technical basis for our annual assessment findings and is reported to the President through the annual assessment process. Through this process, we have been, and remain, able to assess the Nation's stockpile as safe, secure, and reliable. The Department of Energy fiscal year 2011 Congressional Budget Request places high priority on stockpile surveillance. I strongly agree with this emphasis, but there is important further work to be done. Specifically, the surveillance transformation plan was established to better align our surveillance program with the challenges of an aging and smaller stockpile. My fiscal year 2010 stockpile assessment letter to the secretaries of energy and defense and to the chairman of the Nuclear Weapons Council noted the need for a strong focus to complete surveillance transformation, which aims to shift the program from being reactive to becoming predictive and thus allowing us to better anticipate stockpile performance degradation and to schedule required actions.

Today we are surveilling a stockpile for which most of the weapons were designed at a time when long design life was not typically a high-priority design requirement. The radar for the first B61 bomb, for example, was originally designed for a 5-year lifetime; today there are B61s in the stockpile with components manufactured in the late 1960s. It is a credit to our stockpile stewardship program that we have the technical knowledge base to support continued confidence in these weapon systems as they age. However, our surveillance efforts, coupled with the fact of the age of the stockpile, indicate that it is imperative that we begin to execute on replacing the aging components as the lead time for these activities will be 5 to 10 years on a system-by-system basis.

THE LIFE EXTENSION PROGRAMS

The B61 Life Extension Program

The most immediate stockpile challenge for sustaining the deterrent is to extend the service life of the B61 bomb under expansive product requirements and a demanding schedule. The primary driver for the schedule of the B61 LEP is the fact that critical nonnuclear components are exhibiting age-related performance degradation. Another driver for the schedule is the deployment of the F35 Joint Strike Fighter, which requires a new digital interface for the B61. Specific component issues, as well as the overall age of the system, lead me to conclude that we need to approach this LEP with a resolute commitment to address end of life, degradation, and technology obsolescence to ensure long-term safety, security, and effectiveness.

Notably, the scale and complexity of this LEP will be much larger than that of the W76 Trident II SLBM warhead LEP, which is now in production. To extend the lifetime of the B61 with a first production unit in 2017, full appropriation of the fiscal year 2011 funding requested by the administration is critical. We must complete the design definition in fiscal year 2011 to create a firm understanding of system requirements and thus fully establish future-year funding needs. Total cost estimates for the B61 LEP are subject to change until the design definition and requirements are finalized at the end of fiscal year 2011.

To overcome technology obsolescence, it is important that we develop new technologies to insert into the B61. That is why we are conducting considerable technology maturation work in fiscal year 2011. Technology maturation is a rigorous approach Sandia applies to developing new technologies, from the earliest conceptual designs through full-scale product realization and ultimately to insertion into the stockpile. We use a construct of technology readiness levels, first implemented at the Department of Defense and then NASA, and we implement a series of technical and programmatic reviews to ensure that the maturity level of new technologies is understood and associated risks are effectively managed before the new technologies are used in a life extension baseline design. For the B61 LEP, we have more than 40 product realization teams designing components and subsystems and maturing technologies. We are aggressively staffing this program to accomplish our objectives on the current schedule. In July 2010, we had a core of approximately 80 staff on the B61 project. Staffing levels are now more than 3 times that number and will continue to increase. We are planning to have a core of 400 staff on the project by the end of fiscal year 2011. These staffing levels are enabled by fiscal year 2011 funding provided through the continuing resolutions. However, should fiscal year 2011 funding deviate significantly from the current levels, we will not be able to sustain staffing levels, and the scope and/or schedule of the project will have to be adjusted.

The B61 LEP schedule and scope are also, of course, heavily dependent on the appropriated funding in fiscal year 2012 and beyond; multiyear sustained funding is required to bring this program to successful completion. The success of the B61 LEP also requires the necessary support for the nuclear explosive package agency (Los Alamos National Laboratory) and the production complex.

Other Life Extension Programs

The B61 LEP is one in a series of programs with timelines extending to 2035 that have been documented in the Stockpile Stewardship and Management Plan. Among them are the W88 ALT, the W78 LEP, and likely a weapon system associated with long-range stand-off delivery vehicles.

Funding for the W88 ALT has been identified in the updated Section 1251 Report. Sandia is pursuing work on the W88 ALT, which involves replacing the AF&F system and the neutron generators.

The Nuclear Posture Review recommended "initiating a study of LEP options for the W78 ICBM warhead, including the possibility of using the resulting warhead also on SLBMs to reduce the number of warhead types" (p. xiv). Although the Department of Energy fiscal year 2011 Congressional Budget Request includes funding for a W78 LEP with completion of a first production unit in 2021, work for this program has not been authorized by the continuing resolution under which we are operating. Should the W78 LEP be authorized, Sandia is ready to support the warhead systems engineering and integration effort and to fully leverage the work done on the recently completed feasibility study for a common integrated AF&F system. Using an envelope of the requirements for the W78 and the W88, and even the W87 and the U.K. system, our study concluded that this approach was technically feasible, including improvements in safety and security enabled by miniaturization of electronics. Savings in weight and volume, at a premium in reentry systems, can be used for those additional safety and security features. The study results have been briefed to the Nuclear Weapons Council and are being used to inform decisions regarding the scope, schedule, and interplay between the W78 and W88 life extensions. Such an approach offers the potential for significant cost savings for the overall Department of Defense and Department of Energy nuclear weapons enterprise.

Our Capability Base Supports the Mission

Over the next 25 years, we will rise to meet the challenges of a demanding program described in the Stockpile Stewardship and Management Plan, but we also must establish the basis for long-term stability. For Sandia, stability should be viewed in the context of three pillars: infrastructure, broad national security work, and workforce.

Essential Infrastructure and Capabilities

Sandia's capabilities are essential to its full life cycle responsibilities for the stockpile: from exploratory concept definition to design, development, qualification, testing, and ultimately to ongoing stockpile surveillance and assessment. Let me point out a few examples.

The NNSA complex transformation plan designated Sandia as the Major Environmental Test Center of Excellence for the entire nuclear weapons program. Our facilities and equipment in this area are extensive: (1) 20 test facilities at Sandia-New Mexico; (2) the Tonopah Test Range in Nevada; and (3) the Weapon Evaluation Test Laboratory in Amarillo, TX. We use environmental test capabilities to simulate the full range of mechanical, thermal, electrical, explosive, and radiation environments that nuclear weapons must withstand, including those associated with postulated accident scenarios. In addition to these experimental and test facilities, Sandia's high-performance computing capabilities are vital tools for our mission responsibilities in stockpile surveillance, certification, and qualification, and they have proved to be indispensable in our broader national security work.

I am very pleased that Test Capabilities Revitalization Phase 2 funding has been requested in the fiscal year 2012 weapons activities budget. This funding will enable us to renovate our suite of mechanical environment test facilities, many of which were commissioned in the 1950s and 1960s. These facilities are essential to support the design and qualification of the B61 life extension and subsequent LEPs.

Across the nuclear weapons complex, there is a shortage of funding for infrastructure, maintenance, and operation upgrades included in the Readiness in the Technical Base of Facilities program. However, mentioned in the updated Section 1251 Report is the Tonopah Test Range in Nevada, one example that I want to highlight not so much as a funding issue but as an essential mission requirement. Starting in fiscal year 2013, development flight tests must be conducted at the Tonopah Test Range for the B61 life extension.

Another capability that Sandia stewards for the nuclear weapons program and also for the Department of Energy's nonproliferation payloads is the microelectronics research and fabrication facility, where we design and fabricate an array of unique microelectronics, as well as specialty optical components and microelectromechanical system devices. This capability includes a national "trusted foundry" for radiation-hardened microelectronics. We have been providing microelectronic components to the nuclear stockpile at the highest level of trust since 1978 and to the Department of Energy's nonproliferation payloads since 1982. In 2009, Sandia received Class 1A Trusted Accreditation (the highest level of accreditation) from the Department of Defense for Trusted Design and Foundry Services and is the only government entity with this accreditation for both design and foundry operations. We must recapitalize the tooling and equipment in our silicon fabrication facility, much of which dates back about 15 years in an industry where technology changes almost every 2 years. Recapitalization will ensure production of the radiation-hardened components required by the B61 LEP and W88 ALT; this facility is the only source for the key microelectronics required for the life extension work specified. Recapitalization must begin soon in order to eliminate the risk of running existing equipment to failure. Sandia is therefore working with NNSA on a 4-year funding plan to stage the retooling (starting in fiscal year 2013). We have plans for meeting programmatic requirements with a staged funding profile.

I mentioned earlier the need to continue strengthening the tools of stewardship. Let me mention two such areas for Sandia. First, a stable funding position is essential for the material science that underpins the broad range of materials for nonnuclear components in order to move to a more predictive basis for an older, smaller stockpile and prepare for the life extensions. We continue to work with NNSA to ensure adequate prioritization for nonnuclear components material science in fiscal year 2012 and out-year budgets. Second, I am pleased to see budget stability being brought to the area of radiation hardness. As I discussed in my July 2010 testimony, I believe this is an essential element of our strategic nuclear deterrent. We continue to advance the scientific basis for confidently certifying the stockpile to radiation hardness requirements in the absence of nuclear testing. We are also pursuing intrinsically radiation-hardened designs for use in future life extensions such as the W88 ALT and W78 LEP.

Synergy between Our Nuclear Weapons Mission and Broader National Security Work

Today's national security challenges are highly diverse. The NNSA laboratories are contributing solutions to the complex national security challenges. Indeed, as mentioned in the Stockpile Stewardship and Management Plan Summary, "while NNSA nuclear weapons activities are clearly focused on the strategic deterrence aspects of the NNSA mission, they also inform and support with critical capabilities

other aspects of national security" (p. 7). In turn, to sustain and sharpen these competencies, Sandia relies on its broader national security work. The symbiotic relationship between the nuclear weapons and broader national security missions prevents insularity and creates a challenging, vigorous scientific and engineering environment that attracts and retains the new talent that we need. Such an environment is essential to succeed against the challenges we now face. The following examples highlight the way in which this symbiotic relationship works.

Sandia developed synthetic aperture radar (SAR) technology, which was made possible by our extensive design and development work for radars for nuclear weapon fuzing. This technology has been enhanced and is currently used by the Department of Defense. The extensive SAR work has sharpened our radar design competencies and kept Sandia aligned with advances in radar technology, such as radar frequency integrated circuits. We are now applying these modern technologies to the design of the replacement radar for the B61 LEP.

Another example is our work in cyber security. Sandia's responsibilities for nuclear weapons include weapon system architectures and components to support the highest standards of command and control—U.S. nuclear weapons must always work when authorized by the President, and never work otherwise. Our technical expertise in this area was the foundation for contributions to broader national security problems associated with cyber threats. In turn, our life extension work will take advantage of the modern, state-of-the-art capabilities developed for broader national security.

A third example demonstrates how these synergies have worked within the NNSA family of programs. For the past 10 years, Sandia has been leveraging the unique capabilities of our microelectronics research and fabrication facility for Defense Nuclear Nonproliferation. In this effort, we designed, developed, and deployed the next generation of satellite-based treaty monitoring technology, called the "enhanced optical sensor." In turn, we have used the advancements of the Defense Nuclear Nonproliferation satellite project in the nuclear weapons program.

Finally, I want to acknowledge an important step in institutionalizing the relationship between the nuclear weapons and broader national security missions. In July 2010, NNSA, the Department of Homeland Security, the Department of Defense, and the Office of the Director of National Intelligence have signed a governance charter, which provides a framework for the participating agencies to coordinate shared, long-term planning for the science, technology, and engineering capabilities of Department of Energy national laboratories that will contribute to the Nation's broader national security missions.

Workforce

Our talented people are our most fundamental capability. Given the scope and nature of our work, it is mandatory to continue attracting, retaining, and training a highly capable workforce. To do so, we must: (1) ensure that our work is aligned with the national purpose; (2) create a climate of innovation and creativity that inspires our workforce; and (3) create a balanced work environment that is both responsive to the fiscal realities of our times and attractive to the talented staff we need in the future.

Today we are facing a number of challenges. Currently, 37 percent of the experienced technical staff in Sandia's weapon system and component design organizations are over the age of 55. Their remaining careers will not span the upcoming life extension programs. This reality puts a premium going forward on stable commitment to the LEPs. The life extensions provide opportunities for our new technical staff to work closely with our experienced designers: from advanced concept development to component design and qualification, and ultimately to the production and fielding of nuclear weapon systems. Finally, fiscal realities have forced us to reduce costs by addressing the funding liabilities in our pension program, restructuring the healthcare benefits, and simplifying internal processes. All these actions were necessary, but in my view, they can go no further without compromising our ability to attract and retain.

At Sandia, we are focused on creating an environment that reflects our management's vision for success by coupling the experience acquired from our past work with new tools and modern technologies. Such an environment will foster innovation and provide foundational technical and scientific strength to support the stockpile over the long term. The multidisciplinary team we are assembling for the B61 LEP reflects this environment in which the powerful stewardship tools we acquired in the past are being adapted to meet future needs and the latest technologies and innovative designs are coupled with the rigor that comes from experience.

CONCLUSIONS

As stated in the Nuclear Posture Review, "as long as nuclear weapons exist, the United States will maintain a safe, secure, and effective nuclear arsenal" (p. iii). As we enter the new era of the nuclear deterrent, I am pleased to see that a clear strategic direction has been outlined for U.S. nuclear weapons policy in the Nuclear Posture Review and that a collective guidance for implementation has been provided through the Stockpile Stewardship and Management Plan, the updated Section 1251 Report, and the administration's fiscal year 2012 budget request to Congress. The strategic direction for the nuclear weapons policy is also consistent with the New START, which was ratified by the U.S. Senate in December 2010 and the Russian Federation Duma in January 2011. In this context, we are actively positioning Sandia to fulfill its responsibilities in support of the Nation's nuclear deterrent. We are confident in our ability to do so.

The documents referenced above represent a well-founded, achievable path forward, which I understand and support. However, we must recognize that a significant body of work is required to sustain a strong nuclear deterrent into the next two decades, and we must ensure that the resources are commensurate with the requirements and expectations. Specifically, I can be confident that, as an institution, we are positioned to execute stockpile management and deterrence policy to the priorities delineated in the policy documents referred above if the fiscal year 2011 budget is appropriated at the level of the administration's request. Furthermore, the overall fiscal year 2012 weapons activities budget, if authorized and fully appropriated as requested by the President, will provide the basis for continuing the program consistent with national policy. This level of funding reflects a national commitment to strengthening the security of our country and allies by sustaining a smaller nuclear stockpile that is safe, secure, effective, and reliable. Deviation from this funding, however, will impact the scope and/or schedule of the life extension programs. The fact that the three national security laboratory directors were invited to speak before you today and answer your questions is a clear indication of the leadership role of Congress in authorizing a path forward for U.S. nuclear deterrence.

Senator NELSON. Thank you.

In the interest of time, we asked you to sort of consolidate all the statements here, but I would like to take the opportunity to ask each of you what might be your major concern or primary issue that you might like to address at this point, in case we don't raise a question about it.

Why don't we start over on this side. Dr. Hommert?

Dr. HOMMERT. Thank you, Mr. Chairman.

In my written testimony, I raised three issues. The first is something that has already been mentioned, that we're at a very pivotal time with respect to the program and the multiple demands of maintaining the strength of our science base. The need to execute the LEPs, and the need to have the infrastructure commensurate with that, is creating a very substantial demand on the system. I think we have to look at that very actively. We have to demand the highest standards of project management, as Tom has alluded to. But, it is a very fundamental shift of the state of our weapons program, to take on that breadth of commitment.

The second thing I'll mention that's most immediate, for us at Sandia, is the execution of the B61 LEP. The target First-Production Unit (FPU) date for that is 2017. To be at an FPU in that timeframe, that's right upon us now. So, the urgency of the resolution of the fiscal year 2011 budget, where we're staffing up now to hold to that timeframe, is an immediate issue for us at our laboratory. As an example, we need to be flight testing development units in 2013. So, there's very little time for us to adjust, if we're to hold that schedule. Very important issue.

The last thing I would just highlight is an issue of sustaining the people competence, long term, for the institution and in support of the deterrent, and to highlight—I think this is true for all of the laboratories—the importance of the broader national security work that we do and what I would call the mutual reinforcing value of the work we do in other national security challenge areas to interplan and strengthen the basis of our workforce for supporting a nuclear deterrent, going forward. That's an important issue that I think now has become almost inseparable from how we would support the deterrent, going forward.

So, thank you.

Senator NELSON. Thank you.

Dr. Miller.

Dr. MILLER. Thank you very much, Mr. Chairman, for inviting us today, and for your continuing support of these critically important national programs.

The main points I'd like to summarize are, first that the fiscal year 2011 and fiscal year 2012 budgets that have been submitted by the President for your consideration are good first steps. As many of us have mentioned, I think the critical issue is sustaining those budgets over successive administrations and successive Congresses, is critical to the long-term prospect of putting the nuclear deterrent on a firm footing.

The tools that you have so wisely invested in, are now being effectively used to assess the stockpile today. It's critically important that we move forward and take the necessary actions that we learn from those assessments. In the case of an issue that LLNL is concerned about, it's getting on with a study to look at how we might refurbish the ICBM warhead, the W78. It is aging. We know there are issues. We just need to get on with a study to tell us and you, the decisionmakers, what options are the best ways of refurbishing this warhead so that it can continue to provide the deterrence that is so important.

The final area that I would again emphasize is the importance of the science and technology that is derived from our NNSA mission, and the way in which that is leveraged to help the laboratories work on some of the country's most important problems. These are issues from supporting our warfighters in Afghanistan and as Administrator D'Agostino mentioned support of national and international emergencies, like what happened in the Gulf and what has happened in Japan, and at the other end of the spectrum, working to help defend this country against terrorists and cyberthreats.

So, this is a very precious resource, in my view. In these very difficult budget times, I think it deserves your careful consideration. In my judgment, it's critical not only for national security, but also for the economic future of this country.

Senator NELSON. Admiral Donald?

Admiral DONALD. Mr. Chairman, Ranking Member Sessions, and Senator Shaheen, thank you very much for allowing me to appear before you today and discuss my program, the Naval Reactors Program.

I would start off, first and foremost, by just acknowledging that what I spend the bulk of my time doing—I wake up every morning

and go to bed every evening with my charter, and that is the safe and effective operation of naval nuclear propulsion plants. I don't think it should be lost on anyone that we operate 103 reactor plants. We operate them around the world, globally. We are welcome in over 150 ports worldwide. The reason we are able to do that, and including operating in the vicinity of cities in the United States, is that people trust us. They trust us because of our record of success. They trust us to deal with small problems before they become big problems, and to also be open and transparent with them, as far as how our program operates, and to ensure that we're doing good technical work.

The success of the program: We've been around now for over 60 years. We've been operating reactor plants at sea since 1955, when Nautilus went to sea. We've steamed 145 million miles safely without a reactor accident, without a radiological incident that effects the environment or people. That record is attributable to a couple of things; first and foremost, technical expertise and the devotion to the work that we do. But, as much as anything, it has been the very strong and committed support from this subcommittee and from Congress in general. It allows us the latitude to do the technical work that we need to do and to work on small problems before they become big problems, and again, a key to our success.

Mr. D'Agostino has highlighted three key projects that we're starting right now in support of national security. Those are certainly challenging projects. We understand that. But, it's also certainly within our expertise and experience to be successful in those projects. We've completed ship designs; most recently, the Virginia is the new class of submarine at sea, is held up as the hallmark of acquisition programs in the United States Navy right now. We're completing another design for the A–1B reactor plant; this is for the CVN–78, the *Gerald R. Ford*. So, we know how to do these things, and are ready to do it.

What's critical right now, though, is, we're in the early stages of these very complex projects. The funding, early on, is critically important, because now we're setting design parameters, we're setting operational concepts for these plants that will, for the large part, define what the cost, schedule, and capabilities of these plants will be by the time they arrive at sea, when the first *Ohio* replacement goes to sea in 2029. We're doing that right now. Since our equipment tends to be the first that has to be there for the construction start in 2019, we are really in the very meat of the work to do to define what this plant is going to look like and what it's going to cost.

That is where I would ask for your consideration, looking at our budgets, looking at the request that we've made, to ensure that we get off to a good start on these projects, that we have the design maturity that will guarantee success, and that we will be successful in what it is we go about doing.

Thank you very much for your time.

Senator NELSON. Thank you.

Dr. Cook.

Dr. COOK. My principal issue, concern, and direction is to execute the national strategy that was outlined in the NPR, the Stockpile Stewardship and Management Report, something we call the sec-

tion 3113 report, 1251 report, as you mentioned, and now a ratified New START Treaty.

As the program has changed, we've modified our program structure and management structure for execution. As you look at the President's budget, you'll see a 3.1-percent increase in science and weapons activities, a 4.8-percent increase in stockpile support, and a 21-percent increase in infrastructure. The reason for that ties to many of the things that you've mentioned and problems that we're well aware of across the complex.

So, to name a few. Although we often talk in terms of projects, the UPF at Y–12 and the CMRR facility at LANL, in fact, these are basic capabilities for the Nation. One deals with uranium components, one deals with plutonium components and the necessary underpinning of science, technology, and full manufacturing. For example, when one really looks at UPF, it is a factory. It's not just a building. It's the basic capability of the Nation for dealing with uranium components. At LANL, it's not only a facility we're putting in place for actinide research and development, but will have the plutonium stores for the Nation. It will allow us to use other capabilities in a more effective way.

I mentioned the management structure. In order to enable effective execution, we've asked the management and operations contractors, both at Y–12 and at LANL, who have parent companies who are, in fact, experienced and capable in nuclear areas, Bechtel and BWXT, to name just a few. That is based on the fact that we know we have to do these new builds. They are capability builds, but they're new nuclear builds, and they have to be done to modern safety and security standards.

This all ties into stockpile deliveries for DOD. While, a few years ago, we had just one LEP in operation—and we still do, that's the full build of the life-extended W76 warhead that goes out to sea—we, today, have, also, the B61 study—the engineering prestudy and the cost study that we'll complete at the end of this year. We have requested approval to begin the study for the W78 warhead, as Dr. Miller mentioned, and look for adaptable interoperability we could have in two legs of the deterrent.

That's quite a set of things. There are certainly other things, such as high explosives pressing at Pantex, which we have turned on to execute. But, that's what's on our screen.

Thank you, sir.

Senator NELSON. Thank you.

Dr. Anastasio.

Dr. ANASTASIO. Mr. Chairman, Senator Sessions, Senator Shaheen.

First, let me thank you, Mr. Chairman, for your kind remarks in your opening.

I would just like to personally thank this committee for not only all the support the NNSA missions have received over many years, but also LANL and myself, personally. I really appreciate the support of this committee. So, thank you for that.

When I think about LANL, my number-one thought is about the general role of the laboratory. We're a national security science laboratory, and the thing that I worry the most about is, are we a healthy, vital institution to carry out our missions and responsibil-

ities? As we've heard, those are clear, from the NPR that flow down through Stockpile Stewardship and Management plan and the budget profile the administration has submitted. The question before this committee and Congress is, is there funding available, in these difficult times the country faces, to fund this activity?

For me, as lab director, one of the special responsibilities we all have is not only, "Can we carry out our mission today?" but will we be able to do that 15 or 20 years from now, as well. Of course, that's all about, not only "Do we have adequate funding now?" but also we have a stable funding profile that we can plan to, so that we can make sure that the workforce is available that has all the special diverse and deep capabilities that are necessary to meet these mission requirements that are so challenging technically?"

Of course, the budget's been under some stress for some time. We have been working hard to try to mitigate that budget stress, and you've heard some of the strategies. Not only can we take the science and engineering that's so important for the nuclear weapons program, and use it to support other critical national missions around nonproliferation or countering terrorist threats, Intelligence Community work, DOD support, et cetera—not only can we do that, but we've also designed the efforts that we go after with other sponsors to supplement the science and technology base of the laboratory that the core program, and Mr. D'Agostino's program, is not fully able to support. So, we've tried to mitigate the constraints he has on his budget by seeking funds from other sponsors to help support that fundamental capability.

So, when I think about the future, it's not only, "Do we have adequate funding?"—the challenge that you face for the NNSA programs—but, it's even the broader spectrum of national security programs that this Congress is contemplating that will really impact the health and vitality of the institution and our ability to carry out our mission today and well into the future.

Thank you, sir.

Senator NELSON. Thank you.

We'll begin 8-minute rounds for questioning.

My first question relates to weapons funding and gets right to the heart of it. It goes to, once again, Dr. D'Agostino and Dr. Cook. Under the CRs, the weapons activities budget request for fiscal year 2011 for NNSA was provided. This is a substantial increase, some $625 million above the fiscal year 2010 funding level. On the other hand, there is now talk that a permanent budget for the balance of fiscal year 2011 may be $200 to $300 million lower than the fiscal year 2011 budget request, the level at which the weapons program has been operating. What impact would a reduction in fiscal year 2011 funding have on the weapons activities programs, given that we're now half way through the fiscal year?

Mr. D'AGOSTINO. I'll be glad to start, sir. I'd ask Don to follow up.

Senator NELSON. That would be fine.

Mr. D'AGOSTINO. It would have a significant impact, Mr. Chairman. Our ability to execute funds effectively depends a great deal on knowledge of the path forward. We're blessed to have the President request it and Congress follow, and allow us to proceed at the President's request in this area. Even with this uncertainty, Don

has been executing, with the laboratories, to work on the program that we have requested and that the Senate has allowed us to move forward with.

There is this uncertainty, of course, when we look at the debates that happen back and forth. It tends to color the ability to plan and has me thinking about, "Well, should I hire up in order to do the B61 work at Sandia?" For example—the many tens, and even hundreds, of people that are required to put this in place. Because, if it doesn't come through, I might have to fire them. This kind of cycling is very bad for the workforce. It's very inefficient. At the lower levels themselves, if we ended up with a lower level, of course—what would be authorized and appropriated—then, of course, we would have to start making some very significant cuts, because we've started the year at this higher rate.

Don, you might be able to provide some more specifics.

Dr. COOK. Yes. My answer, sir, would be that it would be a substantial change from where we are. With the anomaly in the CR, we have chosen not to waste time. We have a number of weapon systems that are operating beyond their original design lifetime. The infrastructure projects that we must execute across the board are at very key and sensitive steps in design, preparing for execution. The hiring has been going on. The national strategy has been made clear. So, at this point—and particularly now shortly close to halfway through the fiscal year—in fact, any reduction would have a very substantial effect.

Senator NELSON. The effect of halfway through the year is, of course, doubling the impact, also catching you in the middle of hiring decisions, no ability to plan until we know what the number would be. So, we would appreciate you making that clear for the record.

My colleague has also indicated a concern about that. We're going to engage in cuts, we need to know exactly what we're doing, and we have to do it in a responsible way, consistent with what decisions we've made and expectations we have following the New START treaty ratification, as well.

Admiral Donald, we're going to talk a little bit about naval reactors funding. The fiscal year 2012 funding level for the Office of Naval Reactors is approximately $127 million below the fiscal year 2011 request and the amount available for your office under the CR. Can you explain to us what impact this CR has had on Office of Naval Reactors development work for the *Ohio*-class replacement reactor? Are there other areas where the CR is impacting the naval reactors?

Admiral DONALD. Yes, sir. What it has meant, so far, as I discussed in my earlier statement, is, it's put us behind, as far as the work that we're doing to do the concept development and the design work to prepare ourselves to get into construction of key components and to do the work we need to do to make sure that design is mature at the time we start construction in 2019.

Specifically, on the *Ohio* replacement program, this is the design for the reactor plant, and I have to be in synchronization with the Navy as they're designing the rest of the ship, and as I am designing, from the Navy side, the remainder of the steamplant that goes with it. So, there's a very closely coupled relationship here. If I get

out of sync with them, then that will not only potentially delay the ship, it'll also increase cost.

When we look at where we are right now, if I were held at the CR level, our estimate is, is that we'd be looking at a 6- to 9-month delay in the delivery of the ship. Now, that's a long way out, but if you look at the compression of the schedule and what we have to do between now and 2019, compared to what we have done in the past, on Virginia, on the Ford aircraft carriers, we are pretty comfortable in saying that will be a delay of somewhere between 6 to 9 months.

Similarly, on the Navy side, if there were reductions in funding on the Navy side that remained in the CR for the rest of the year, you looked at the entire ship, you would be talking to a 1- to 2-year delay, potentially, in the delivery of the ship.

There are also personnel costs associated with that, and hiring. We would not be able to hire, our estimate right now is, somewhere on the order of 100 to 150 people to support the designers that we'd need to get in place to do that work. You can't ramp that up overnight, because these are highly technically sophisticated individuals. They need experience in what they're doing. We're in the middle of a demographic change in our business, where we have a lot of senior folks ready to retire. We want to transfer that knowledge over to the younger folks and help them become more effective at what they're doing in the design work.

Then we would be looking at potentially having to lay people off, both in the shipyards and in our laboratories. Our estimate, if we stayed at the CR level, would be somewhere on the order of 50 people. That would just be the beginning of where we would start.

So, it's a significant impact. Again, very early in the design work, where there are really two key technical challenges that we're looking at in this design. The first is, we want to build a reactor plant—a reactor core that will last for the life of the ship. This is a 40-plus-year ship. We've done life-of-the-ship cores for *Virginia*-class at 33 years. We've never gone to 40. You would ask, "Why would you want to do that?" If we can do that and eliminate that lengthy refueling overhaul in midlife, like we do for the *Ohios* right now, then the potential exists that we would not have to have as many *Ohio* replacements right now as we do *Ohios*. We have 14. We would be looking to buy 12 of those ships instead of 14, because you've bought more operational availability if it's not sitting in the shipyard. There are technical challenges to that. We believe we are capable of meeting that challenge. That's key to this early design work that we're doing.

The second thing we're putting on this ship is an electric drive. We're changing the propulsion mode from the standard steam turbine reduction to electric drive. What that brings you is enhanced quieting. In a submarine, stealth is everything. A deterrent is not really a deterrent if people can find it. So, we want to make sure it cannot be found. Given the fact that this ship will be operating out to 2080, we feel that it's necessary to make the investment upfront in this stealth technology to ensure that it is a viable asset well into the future, long after we're gone from this business.

So, those two key technical challenges, the importance of the early investment in the design, that's where I'm concerned. If I

can't get that investment now, and get those parameters and that design work done now, and the right people in place, puts that at risk.

Senator NELSON. Thank you.

Senator Sessions.

Senator SESSIONS. Thank you very much.

It's difficult to overstate the fiscal crisis this Nation is in. Admiral Mullen has said it's the greatest threat to our national security—our debt. This year, we will spend $3.8 trillion and we'll bring in $2.2 trillion. Forty cents of every dollar is borrowed that we're spending today. People know that I believe in a strong Defense Department, so the reporters, first thing they want to ask is, "Well, is the Defense Department immune, Senator Sessions? You want to cut everything else. But, is Defense Department immune?" DOD is not immune. I'm just telling you, and neither is DOE. DOE came forward with a budget request for next year of 9.5-percent increase. They're not going to get a 9.5-percent increase. We don't have the money.

What would happen in a private world? Since I'm the ranking Republican on the Budget Committee and I'm living with these numbers every day, forgive me; but you have to get in your head that things have changed. That's all I'm telling you, that things have changed. The ability to go first-rate on everything we did and be able to proceed and pay big salaries and bonuses and build new buildings and all—of course, I guess the weapons complexes haven't seen a lot of increases in a long time, there's no doubt about it. That's why we have to go forward. But, every dollar has to be fought for, Mr. D'Agostino. If you can build a building for a little less, you have to do it.

So, to follow up a little bit on the Chairman's question, the House CR version calls for a $312-million reduction; the Senate's; $185 million. Can you give us any more information about how much could be sustained and how much can't be sustained to reach your mission? Because I am of the long-term view, I think that all of you share, that we have diminished the weapons complex for a very, very long time, and it's at a very dangerous stage. We made a national commitment. The President made a commitment as part of this START Treaty.

What can we do? What can you tell us about how much you have to have to stay on track without doing damage to the program and ending up costing more than otherwise would be the case?

Mr. D'Agostino?

Mr. D'AGOSTINO. Yes, sir. I might start, and then, as you wish, I'll let our colleagues add in, as well.

You had talked specifically about the $312 million and the $185 million numbers, the differences, maybe, between House and Senate at various stages of the bills. One is a 50-percent reduction to our plans on increases and——

Senator SESSIONS. Fifty-percent reduction of what, now?

Mr. D'AGOSTINO. The $312 million is about 50 percent of the $624 million that was requested, the difference between——

Senator SESSIONS. Six-—the 624 increase.

Mr. D'AGOSTINO. Yes, sir.

Senator SESSIONS. All right.

Mr. D'AGOSTINO. Right.

Senator SESSIONS. See, the American people are getting a little confused about all this.

Mr. D'AGOSTINO. Right.

Senator SESSIONS. You get an increase of 600 and you reduce that increase to 300, and you say you have a cut. I guess you have—since we started the year at the higher number, I guess you can say that. But, the way our budget projections work is that somebody projects it's going to increase it 3 percent, and you say we're only going to increase 2 percent; they say that's a cut. But, to the average American, that's not a cut.

Mr. D'AGOSTINO. I understand, Senator. As you mentioned, we are digging ourselves out of a hole.

Senator SESSIONS. But, you only get half as much increase as you hoped to get.

Mr. D'AGOSTINO. As a result of that, we won't be able to do the type of program we put forward that we believe is necessary for the NPR, specifically in three broad areas. We can delve into the details as we have time to.

The first area is our work on the stockpile itself. At a 50-percent reduction—and, of course, we've been spending at the higher rate, as authorized in the CR, so it is—it has a magnifying effect—will result in significant changes to our B61 life extension work, just to carry that particular problem forward, this life extension is absolutely critical if we're going to get the system modernized in place so that it continues to support the Nation from fiscal year 2017 and beyond. So, if we don't do this life extension work that we have planned, it will have a grave impact on our ability to maintain that particular warhead for our stockpile, which DOD and the President both believe is necessary to do. That's a huge upfront impact.

Senator SESSIONS. So, no money invested in that except for the new money that you got?

Mr. D'AGOSTINO. Certainly, we have existing money to maintain the B61, which is what we call surveillance work. It's like lifting the hood and looking inside the warhead and maintaining it. But, our ability to move forward with the life extension in time to meet our 2017 date will be impacted, and we would have to scale back significantly the type of work, and do the bare minimum necessary on that particular warhead.

The other significantly large area—that's an example in directed stockpile work—that would be impacted, I believe, is our ability to bring on board, for the Nation, a uranium and plutonium capability. It will be impacted. It'll be pushed out a few years. These are what have been called projects, but which Dr. Cook correctly describes as national capabilities. I believe the committee understands that these aren't just capabilities to take care of our stockpile. They are, at a minimum, that. They are a lot more than just taking care of our stockpile. These are the capabilities that are absolutely critical in order to work with plutonium and uranium, which is absolutely necessary for us to do nuclear counterterrorism work and do the nuclear nonproliferation work which many—including myself—feel is part of our integrated national security—our nuclear security mission space. All of this ties together.

We want to get out of buildings and capabilities that were put in place in 1952. Even if we proceed at the President's requested level, we'll have been in these facilities for close to 70 years, as a matter of fact, because the capability won't come on board for another 10 years or so. So, moving forward is absolutely essential in order for us to maintain our stockpile and to maintain the nuclear security work.

I've talked plenty. If you will, sir, I'd like Dr. Cook to provide some background.

Senator SESSIONS. All right.

Dr. COOK. I'll add a few words. Let's see, the difficulty is that, at the same time, we must replace 60-year-old capabilities in special nuclear materials, uranium and plutonium. We have weapon systems that are now operating beyond their original design lifetimes. The President's fiscal year 2012 request is for the 20th year in which we have had a moratorium on underground testing. So, if I start with one point, it is, we must effectively put the complex to work, that waiting further, not investing, is a clear decision to take on additional risk in all three areas that I mentioned. Those are fairly severe.

Now, if I can look to hope at all here, it is that we can reform our management practices, as the Administrator said, improve the way in which we're doing work. So, we're looking at the industrial suppliers—I've already mentioned the parent companies of LANL and Y–12, people who bring to the government sector the best industrial practices. We're already moving forward to directives reform, reform of the DOE directives in which we are seeking to adopt consensus standards—ISO–2000, ISO–9000, ISO–14000. I'll state an assertion that, in many areas, not nuclear areas, is a better way to go to improve speed, efficiency, and the conduct of all work. We can clearly improve our management disciplines.

But, the core issue I'd start with is, if we don't effectively put the complex to work, all aspects—research and development, project development, rebuilding the capabilities, and mainly manufacturing warheads, but based only on the previously tested designs, with no new military capabilities or requirements—that is clear. That's national policy. Waiting will not make it better. I'm sure you understand that. But, we could improve some of our business practices.

Senator SESSIONS. Admiral Donald.

Admiral DONALD. I wouldn't want to walk out of here and leave you with the impression, Senator Sessions, that we don't understand the significance of the fiscal problem that we face. But, also, I want to leave you also knowing that we view it as our obligation to do the best that we can to operate as efficiently as we possibly can. If you look at our budgets over the last—really, since I've been in this job now, 6½ years, we've been relatively flat, essentially adjusted for inflation. Even within that budget, we took on the project to put our spent-fuel handling capability in place so that we could transition from wet fuel storage in Idaho to dry fuel storage to keep us in compliance with our Idaho agreements that we entered into in the mid-1990s. We did that within our budget and didn't come and ask for any additional funding to do that. That came at a price, though, because the assumption was, if we were tasked with new

projects, we'd have to come to you and ask you for some additional resources. What you see in our increase in funding—the $125 million between fiscal year 2002 and fiscal year 2011, and then the additional into fiscal year 2012—really reflects those three projects that Mr. D'Agostino had mentioned. We're working against the clock on all three of those projects. The *Ohio* replacement, I've already mentioned, if we make decisions today to delay, it'll have the impact in 2029, when a replacement ship is not there to cover for the one that went out in 2027. The prototype refueling, I'm working against physics, because the fuel is being depleted in that prototype right now. Not only is that where we're going to do the derisking of the technology to build a core for *Ohio* replacement, but that also is going to provide the training platform for one-third of our nuclear operators that go out into the fleet. So, I need to go and replace that capability, as well.

Then finally, the spent fuel handling facility in Idaho—I have a water pit out there that has 25 metric tons of spent fuel in it, and some parts of it are over 50 years old. It needs to be replaced. It's not at current code. It's not particularly efficient. From our perspective, technically, it's not a situation we want to live with much longer in the future.

That's the timeline that we're working to and why we've come to you to ask you for this assistance for these programs.

Senator SESSIONS. Well, it's $84 billion over 10 years on total program, and that's a lot of money. We just need you to be thinking any way possible to keep those numbers at as reasonable level as possible. But, the United States of America cannot not have a reliable nuclear arsenal. It is not acceptable. So, we have to find the money. I hope that you won't take the view that some government people seem to take sometimes that, "I'm not going to affect any efficiencies. You either give me money or I won't do the new project you want me to do." But, no business operates that way, what businesses have to wrestle with every day. Families have to make priority choices, and we're asking you to do that because I want to protect this program.

I do think $300 million is clearly too much of a reduction, Mr. Chairman. Hopefully we can figure out a way not to go that far.

Senator NELSON. Thank you, Senator Sessions.

Senator Shaheen.

Senator SHAHEEN. Thank you, Mr. Chairman.

Thank you all very much for being here this afternoon.

Mr. Chairman, I know that the Emerging Threats and Capabilities Subcommittee normally handles the nonproliferation portfolio, but it's come up a little bit in testimony, and so I would like to raise the issue here and follow up on some of the budget questions.

As you pointed out in your testimony, Mr. D'Agostino, President Obama, in talking about the threat to this country, pointed out that a nuclear weapon in the hands of terrorists is probably the biggest threat that we all stay up nights worrying about. I was really horrified to see that, according to International Panel on Fissile Materials, the global stockpile of highly enriched uranium, which is the easiest material for terrorists to use to make a nuclear weapon, in 2010 was enough to make more than 60,000 nuclear weapons. So, given the insecure nature of these materials around

the world, clearly this is a threat that we should all take very seriously.

While I appreciate, and know that you all do, the need to address efficiencies in our budget, and to deal with the country's debt and deficit, I am concerned about the proposal in the House's budget that would have cut $600 million from nuclear nonproliferation programs. I wonder if you, Mr. D'Agostino, or any of the other panel members, could speak to what that would mean, in terms of what would not get done if that cut is realized.

Mr. D'AGOSTINO. Okay. Thank you, Senator Shaheen. Absolutely. There is clearly a connection between these investments in the weapons activities account of the subcommittee's jurisdiction and how it impacts other elements of NNSA. The Defense Nuclear Nonproliferation Program absolutely counts on Y12, for example, in order to be able to have a place for this highly enriched uranium that we're bringing back to be processed, characterized, put in a situation so it can eventually be used as part of the national stockpile to support the naval reactors program for propulsion out into the future, as well as be available for downblending into low-enriched uranium to turn this into, ultimately, electricity for peaceful uses here in this country. So, these investments in the weapons account are directly connected to the nonproliferation program. I think that's an important point. I think the subcommittee understands that.

I'm deeply concerned with the reductions in the nonproliferation program. Again, these are reductions from the request as Senator Sessions has pointed out—because what we are in the process of doing is implementing an aggressive but important program to lock down nuclear materials worldwide in 4 years. We don't do it by ourselves, of course. We do this in partnership with over 100 countries. But, we do require expertise from this country. Work that happens at Sandia, LANL, and LLNL, in fact, provide the core expertise in order to say, "What's the best security system to design in Russia? Or—and how do we put it in place? How do we know that it is actually in place and working as it should be?" So, these laboratories provide the foundational element of that. That $600 million would have a direct impact on our ability to implement the security—what we call first line of defense—secure the material in place. It would also have an impact on our ability to convert research reactors from highly-enriched uranium to low-enriched uranium, a plan that we have laid out. We've converted 70 reactors so far, but there are many more research reactors that we know exist that we have a plan laid out to convert these research reactors from HEU to LEU. It would impact the ability for us to put radiation detectors at seaports, land border crossings, airports, and the like.

Obviously, if we are faced with a reduction, if you will, from our original plan, we will seek to fund the highest-priority work, the most important work, first. But, an element of maintaining nuclear security isn't just doing the security work in place, it's making sure that other nations who are in the process of bringing civil nuclear power do so in a way with the appropriate nuclear safeguards in place. So, we have an element of our program that is designed in

order to help other nations have the right nuclear safeguards in place.

I believe it would have a significant impact on our 4-year lockdown effort. I think this is the effort where we have a very clear direction that everyone feels is an important direction to go to. That's essentially where we are right now.

Senator SHAHEEN. Thank you.

Do we have a limit on our time?

Senator NELSON. Eight minutes.

Senator SHAHEEN. Okay.

Dr. Miller, you talked about your concern that we may lose some of the best scientists and technicians if we're not able to ensure future funding and a commitment to the program. I wonder if you feel like we're currently investing enough in our future workforce, and what kinds of things we ought to be doing to ensure that we can attract the best and the brightest people to the program.

Dr. MILLER. Thank you very much, Senator.

Picking off of the recent conversations with Senator Sessions and yourself at the laboratories—LLNL, in particular—we have reduced the overall staffing at the laboratory by about 2,000 people over the last 5 years.

Senator SHAHEEN. Two thousand out of how many?

Dr. MILLER. Out of about 8,000. So, there were 8,000.

Senator SHAHEEN. Wow.

Dr. MILLER. There are about 6,000 now.

Two years ago, I testified that I thought we were in danger of losing the fundamental science, technology, and engineering capability that the country relied on. That decline was stabilized in 2010. We have seen, again in my words, modest increases. Dr. Cook talked about 3 percent. That's only a slight—a percent increase or so above the rate of inflation, but it is positive. We have begun, under the CR and the President's planned budgets for 2011 and 2012, we have started growing that back to a level that, in my judgment, would be sustainable over the long term. The same issue would occur if there were substantial cuts in the nonproliferation program. Again, these are substantial investments in fundamental people that provide the technical capability to build radiation monitors, and provide advice to the government.

In my view, as I testified 2 years ago, the most important part of securing the talent at the laboratory is that the scientists and engineers understand that they have a stable future. They are very highly trained, very highly technically qualified, and they want to be assured that they can work on some of the country's most important problems. If they can, we don't have difficulty hiring them, nor do we have difficulty retaining them. But, when there are budget ups and downs and uncertainties, that's when we have difficulty.

My judgment is, as Dr. Anastasio talked about earlier, one of my fundamental responsibilities is the long-term health of the laboratory so it's capabilities are there when the country needs them to apply to whatever the country's most important problems are. For me to do that, the most important thing is stability and national consensus on what we're doing. I think we have the national consensus in the Congressional Bipartisan Commission that has been

referred to, the NPR, and now the START treaty. We have that consensus. What we need now is to fund the programs that support that policy.

Senator SHAHEEN. Thank you. My time is up.

Senator NELSON. Thank you, Senator.

Let's take a second and talk about extending the replacement facilities, and what that implication is, in terms of being able to deal with a $100 million shortfall in 2011 and whatever we might face in 2012. Admiral Donald, in looking at replacing the facility that you have under your authority, we have 40.6 million for conceptual design, and that would be a new spent-fuel building to support the NR program. In fiscal year 2012, the request for conceptual design is $53.8 million. The construction wouldn't start until 2013. What would be the implications, in terms, first, of fiscal impact, and then the second implication, in terms of what it would do to our national security if this were to be extended 1 or 2 years into the future?

Admiral DONALD. This is our spent-fuel facility in Idaho. All of the spent fuel, when we refuel aircraft carriers and submarines, or defuel them at the end of their lives, this fuel is shipped by rail to this facility. What we do is, we put it in a large water pit and it cools down for a period of time. We also examine it to make sure it's performing the way it was designed to perform. Then we process it for dry storage, to be in compliance with the agreements that we have with the State of Idaho, for all spent fuel to be out of wet storage by 2023.

So, the issue with this facility right now is, as I've mentioned before, it's aging. Most parts of it are 50 to 40 years old. It is not in compliance with current code. In fact, it has cracks in it. We know that for a fact. We manage those cracks, and we deal with it. It does have some seismic liabilities that we manage. But, from a point of view of just stewardship, this is a facility that, in fact, needs to be replaced.

There's another element, as well, in that we are in a very intense period of fuel handling in our shipyards that's being driven by the *Nimitz*-class aircraft carriers. They're all coming in for their midlife refuelings. They're heel-to-toe. Right now, the USS *Theodore Roosevelt* is completing hers. Next will be USS *George Washington*. We will be heel-to-toe in these refuelings now for a very long time, all the way out through the retirement of the most recent ship, 50 years from now. There will be one in some sort of a fueling availability. We have to be able to move that fuel out of the shipyards. To do that, you have to have an efficient and capable facility. It has to be configured to take the fuel as it is designed when it comes out of a ship.

We have had to, because of this heel-to-toe refueling, redesign how we take the fuel out, reconfigure it into a new system, and the facility has to be redesigned to accept this new fuel. Otherwise, I would have aircraft carriers backing up in the shipyards. They wouldn't be available to do what they're supposed to do. Or, we could have fuel that we have no place to put.

So, the target is 2020. That's when I have to have the new facility in place. The construction starts in 2015. The construction design starts in 2013.

What we're talking about in a delay is, it's really a day-for-day, because it's a fairly structured process of design, design maturing, and then buying the pieces, the heavy equipment that you need to go do this. So, you're talking about slipping out beyond 2020. When that happens, we're going to have to have another place to put that spent fuel from the aircraft carriers.

The best way we would do that would be with new shipping containers—more additional shipping containers. Each one of these shipping containers costs about $22 million. For a *Nimitz*-class aircraft carrier, that's nine shipping containers that you would need. So, that's a $200 million bill that you'd be talking about if we couldn't get the facility done by 2020, for each *Nimitz*-class aircraft carrier that comes for refueling.

That's the timeline that we're on, the impact that we're talking about. Then, there's a day-to-day impact of just doing work in an aging facility. Things break, and you have to go and fix them. It results in inefficiencies in how we deal with our business.

So, I think that should capture it for you, the subject of your questions.

Senator NELSON. Let's talk just a second about the delays in the naval reactors. The construction project to receive and handle M–290 spent-fuel shipping containers is about a year late. Would these be the shipping containers that you're talking about?

Dr. COOK. Yes, sir, they are.

Senator NELSON. They're a year late. The most recent schedule indicated that the approval would start construction CD–3 in the second quarter of fiscal year 2011. That ends tomorrow—or, it begins—second quarter fiscal starts tomorrow. No, I guess it ends tomorrow. Can you give us some idea of the delay? Because, if there's already a shortfall, in terms of what we're looking at, in terms of money to be able to do, does this delay just add to that problem?

Admiral DONALD. Well, where we are—the CD–0 was—that was completed in 2009, I believe it was—CD–1, we have—we want to complete by fiscal year 2012—the end of fiscal year 2012. Because of the delays in funding we've seen so far, we are, in fact, behind in the design. We've been able to—at least to date, because the numbers have been relatively low, we have been able to continue some of the fundamental work. We're engaged, right now, in the environmental impact statement and the concept design work, and continuing that. But, really, this year and in 2012 is when we have to get the work completed to make the selection at CD–1 of the type of facility, what it's really going to look like, where it's going to be located, and how it's actually going to work—be configured to do the work that we need it to do. So, this is really a crucial point in the design, because you do set the basic parameters that define the cost and schedule for the rest of the program.

Senator NELSON. Mr. D'Agostino, I am one who has been very interested in the efficiencies initiative at DOD. Secretary Gates has directed all elements of that Department to identify efficiencies that can be reutilized. I heard earlier discussion—I think Dr. Cook said—about efficiency and management programs and what you can do. Could you identify, maybe, for us some of the efficiencies that perhaps—a project that has been identified for the next 5 years. Have you gotten to the point where you can do that?

Mr. D'AGOSTINO. Yes, sir. I mentioned one in my oral statement. We talked about the supply chain management center. This is something that I started in 2007, when we realized the way we were operating whereas, more or less—and this isn't quite a fair statement—I mean, there are no completely independent sites, but eight sites. We felt there were great efficiencies to be achieved by operating as an integrated and interdependent organization, where we would look to drive efficiencies in not having three capabilities to do the same thing, but dropping us down to one or two capabilities, when it's—where we need redundancy for a national capability, then we would have that. At that time, we felt we could go from 35 million square feet—take 9 million square feet off of our 35-million-square-feet enterprise of buildings and things like that. So, we have 9 million square feet of space that we're moving out of.

Another area of efficiency that we hope to implement, and have implemented part of the way, is to reduce the amount of security space that we have to protect in our enterprise, to consolidate nuclear materials to fewer geographic locations and to fewer sites within those geographic locations. Because, the fewer locations that we have to protect, the less expensive it is to maintain. As a result of those efficiencies, more recently, we've been able to take our $765 or $770 million security budget and drop it down to, like, about $22 million or so.

At Y12, we plan on going from 150 acres of high security space, ultimately to 15 acres of high security space. That shift—and this is where this uranium processing capability that we want to shift into—will allow us to move forward and save what we believe is a total of $200 million of operating expenses, both in security costs per year, as well as operating efficiencies, by getting the whole enterprise right-sized, if you will, leaving, kind of, the cold-war enterprise behind us, and shifting to a much smaller, more integrated future enterprise. Those are the macro pieces that we have before us.

There are a number of other specific initiatives we have, looking forward. One of them is to look at putting together a common work breakdown structure. This is something that Dr. Cook is implementing in the weapons program. We're looking at linking the formulation of the budget to the execution of the budget in a real way. We've brought into our organization some folks that have direct budget formulation and execution experience from OMB. Phil Calbos is here in the room. He really understands this work, and he works for Dr. Cook directly in this particular area.

I'm optimistic. I could talk for a while, but you probably don't want me to.

Dr. COOK. If I could add—and give you one past one and one future one.

A past one that we had in this year. We knew that, when we got the training and the tooling in place at Pantex, that we would be able to do some of the disassembly work more rapidly and completely safely. That was proven. So, we had a target of number of disassemblies, and the Pantex operation, with the training and the tooling in place, exceeded that target—in fact, there was another 26 percent—so, 126 percent on 100—and in a year in which there

was a major flood at Pantex; if you recall, more than 10 inches of rain on a very bad day in the city of Amarillo, and the ground couldn't absorb that much rain. In our programs, we're taking account of that effect. We're using efficiencies to make sure that we can recover from that.

Now, that's the past. I said there was a future. When you look at the—it often is called "common"—we really mean "adaptable and interoperable" study for the ICBM warhead, the W78 and the SLBM warhead, the W88. Provided that we can get authorization to move ahead on that, we have the potential to save cost and to have interoperability in the arming and fusing—arming, fusing, and firing units, that Dr. Hommert could address, or in the nuclear explosive packages, that Dr. Miller or Dr. Anastasio could address. What we do know is, if we don't do that work in a joint way, it's going to cost more, and so, some of this may be cost avoidance. It doesn't matter. It's still cost savings in the end.

Mr. D'AGOSTINO. Admiral Donald may have one, as well, if you have time, sir.

Admiral DONALD. Yes, sir. The *Ohio* replacement has been one that we've obviously been focused on here for several years now. But, in the name of efficiencies, one of the issues is, we work through DOD's acquisition process. We were the first program through that new process that Dr. Carter headed up. But, we were challenged to drive the cost of that ship down. As far as our part was concerned, one of the key decisions that was made, that helped us in that regard, was the decision to go from 20 missile tubes to 16 missile tubes. Because, what that allowed us to do was to downrate the propulsion power that was needed. So, obviously, it's a smaller reactor that you would need. But, what it also allowed us to do was to go back—the size fell into the envelope where we could go back and use components that we had already designed for the *Virginia*-class and bring those into this design—not have to do it over again—but, several of the mechanical components, to use those over again. It enabled us to drive the costs of that propulsion plant down and rely on proven technology that's—pumps and valves and things like that don't change like electronics do. So, we're pretty comfortable putting that in a ship that will be around til 2080. But, we were allowed to do that.

Senator NELSON. Well, in the absence of my colleagues, perhaps I'll just continue.

Last March, when we held subcommittee hearings, we were focused on the protective forces that guard the nuclear weapons and materials at DOE sites. Mr. D'Agostino, are you suggesting that you've been able to consolidate some of those sites, which now means that the actual cost of security for those has been reduced?

Mr. D'AGOSTINO. Yes, sir. The security costs have been reduced. We are also looking, very much so, at other opportunities to go forward even more. Dr. Miller and Dr. Anastasio are quite familiar with our joint effort to look at, instead of the Nation maintaining two separate plutonium capabilities to deal with large quantities of plutonium material, one at LLNL and one at LANL, we've decided to consolidate to one plutonium capability, and it's a national capability. It doesn't belong to LANL. It belongs to the Nation. But, both laboratories can work in one particular facility. That effort to

reduce the amount of plutonium—we have a commitment to get this done by 2012—will allow us to change the size and the nature of the security forces at LLNL. Dr. Miller may be able to add to that, if he'd like.

There are other things that we're doing in the security area. We're pushing towards common uniforms, for example, which get the security force together in a particular fashion to essentially show that this is a cohesive unit. Even though they're managed under different contracts, there are opportunities to drive some commonality there.

We're using what I would call life extension activities for the security vehicles that we have in place. We're using technology to put in long-range detection capabilities and look out, further out, and rely less on humans, if you will, and guards—guns and gates—and put technology into the picture. We're introducing this in our training capability.

All of these things have saved tens of millions of dollars a year. Brad Peterson, who runs that particular activity, working with the labs and our production plants, have been able to do that. That's why they've—we've been able to reduce it. I keep challenging Brad in this area. I do think that, as we get to fewer sites with large quantities of nuclear material, there are some further opportunities.

But, we can't do it in a way that this whole purpose is just to drive costs down. I mean, in—or, to try to spend less money. We obviously want to make sure the security—as we're making these changes, we don't lose that kind of operational focus that we've had in the past.

Senator NELSON. Now, the goal is, obviously, to create the best security at the most reasonable cost.

Mr. D'AGOSTINO. Yes, sir.

Senator NELSON. So, I understand that. It's obvious that the primary goal here is to protect the materials and the weapons. So, we'll have to deal with that.

In December, NNSA made a significant change in the way you manage the aviation program of the source of Office of Secure Transportation (OST). As part of this change, the DOE aviation program will have increased oversight responsibilities for the NNSA program, in lieu of the FAA. Is there a plan that's in place for DOE Aviation Office to oversee this NNSA program? Dr. Cook, would that be your area?

Dr. COOK. Yes, it is my area, sir.

If I could address some of the driving factors and where we are, I'd like to do that.

The focus that we have in the aviation area is looking forward to the LEP work that we have to the material moves, whether they're special nuclear materials or not, and to the limited-life component exchanges that are required across the country. In order to focus on the efficiency and the effectiveness, we've taken a look across the board at the OST and have concluded—and we had a plan to replace our aging fleet of three DC–9s with 737s that would still be used airplanes, but would have perhaps only 10 years of life on them. We're part way through that effort. One of the DC–9s has been sold. Two 737s have now been acquired. In parallel with that,

we're looking at the equipping contracts, the maintenance contracts, and the nature of the pilots. We also have taken the opportunity to sell aircraft that we no longer needed. We've sold a couple of Twin Otters and one other airplane, and are focusing now on those things that tend to be inherently Federal functions. Specifically, the aviation fleet for OST will be focused on moving the emergency response teams for radiological or nuclear threats effectively and as rapidly as we have in the past. As far as maintenance, given that we're going to have different aircraft, three 737s, rather than three DC–9s—we intend to competitively place the maintenance contract that is currently in place. Given the future need, we've taken a look at the nature of the pilots, although there are a small number of pilots, 15 or fewer, to operate around-the-clock and have the emergency response capability. We're looking at whether it makes sense to Federalize those pilots, or not.

There are different standards that the FAA requires for different types of aircraft flights and different missions. We are working hand-in-hand with the FAA. We also work with the Office of Aviation Management within DOE, but outside NNSA, and I've given you the base for looking forward with this. The core objective here is to focus the activity that we have even more tightly on the mission, while we replace the aircraft, and then put in place the maintenance contracts for future years and for pilots to do that.

Senator NELSON. Going back to the question about the security guards, has—have you addressed the—Mr. D'Agostino—the need to deal with the retirement issue for the Guards? Are we having some sort of a program that—perhaps an accelerated 401k program—some system of reduction of that guard force?

Mr. D'AGOSTINO. Yes, there was a report that had 29 recommendations in it to address, frankly, a whole waterfront, if you will, of security guard issues that had cropped up over the previous 5 years. We've worked our way through 14 of those recommendations, I think smartly, dealing with making sure that there was a career path and a progression with those guards. In fact, we didn't do it just with ourselves. We made sure that we had security guard representation to identify these areas and work through these.

We're now dealing with, if you will, the second half of those. We're undertaking a study right now. Some of them have to do with the question of whether there should be a 20-year retirement. What are the differences between a security force that's a static security force around a fixed location, versus a dynamic security force, such as the OST discussion we were just having earlier, that's moving about? How equivalent is that to the U.S. military, which has the 20-year retirement? These are the more difficult and more challenging questions, the ones that you've described, and we're looking at how to put that forward.

But, I think what we have is a path forward, with the unions' representatives that are there, to kind of address these 29 recommendations systematically, and work our way through them. We haven't finished the job. Right now, we're in the process of comparing the different types of retirement systems.

Senator NELSON. The retirement systems could be different, depending upon the requirements for the employment and what's required for employment. In other words, what kind of background,

what kind of education requirement there might be as part of the job. So, I would think that would be a good thing to work on, because of the—it looks to me like you're going to be seeing a further reduction, at some point along the way, and having that taken care of upfront is almost always better than dealing with it after the fact.

Mr. D'AGOSTINO. Yes, Mr. Chairman. I think, with respect to the security guard force, what we've observed—because we do have a few different models across our enterprise, and we're looking to drive—taking the best approaches out of each of these models. One of the main concerns is, particularly for those particular guards that are in a very active, what we call, a fighting position, is, we want to make sure that if they end up getting hurt—the knee hurts; that they aren't now, all of a sudden, laid off. We've observed that there's some value to have the security guards be actually a part of the M&O contractor workforce. That way, if there's a difficulty in meeting the physical requirements to continue in this position, they can be retrained and stay and have a full career, if you will, and serving our country as an active worker in the M&O contract.

We're very much in tune to that. The guard force, particularly, is concerned about making sure they're not in a position of, "Well, if you get hurt, then, I'm sorry, you've lost your job." We definitely don't want that.

Senator NELSON. Dr. Anastasio, I don't want you to think that your trip here was not worthwhile, not having asked very many questions.

Dr. ANASTASIO. Every trip here is worthwhile, Senator.

Senator NELSON. Is there anything that we haven't asked here that we should have asked or would be important for us to have asked, as you think about the budget issue, trying to cut, not slash, appropriate reductions, recognizing any cut has some implication? What we want to do is avoid the unfortunate implications, or the unfortunate consequences, of something that was not well thought through.

Dr. ANASTASIO. Yes sir, I'd have a few comments along those lines. First, as far as efficiencies we've been talking about, of course, not only at the administration's level, at the Federal level, that the laboratories were working on that, too. As an example, last year, in fiscal year 2010, at LANL, we increased our purchasing by $209 million, and we did that with fewer staff. So, we were able to get a lot more work done, and actually were able to downsize the staff.

The laboratories really made great strides in improving our efficiency. In the hearing we had last summer, I was worried about the pension system, and one of the ways we've been dealing with the pension system is to use some of the savings that we've accrued. That's available for us to put not back into science, unfortunately, but at least to cover the pension costs.

You ask about what would happen with delay of major facilities. I had a few thoughts on the CMRR facility, what would happen with the delays there. Senator Shaheen talked about nonproliferation. Just a reminder that this facility, the CMRR facility, is where all the inspectors from the IAEA that go around the world that

look at nuclear facilities, we bring them out to Los Alamos and train them. That's the facility that that's done in. So, again, it's a multi-use facility, a national capability, as Mr. D'Agostino said.

With a delay, of course we'll have to continue to operate in our old facility, which right now is almost 60 years old. It happens to be literally on top of an earthquake fault—not the best place for a nuclear facility. We have a reminder of that with what's going on in Japan.

By delaying it, also we put at risk when we'll be able to increase the capacity for pit production at the laboratory. The LEPs that we have planned are going to require some pits to be made even with the reuse of existing pits, we may run out of them. So, it's building more of the same pits that we already have in the stockpile. Of course, the CMRR facility will not build pits, but all the samples that are taken to qualify a new pit are used in the existing facility. We don't have the capacity or the efficiency to get that done in time. So, if we are delayed with CMRR, then that's going to delay the time we'll be available.

Of course, the other thing we do is—the facility is separated from our pit production facility, and then we're shipping samples of plutonium around on the road. So by doing that, of course, that's a security risk. By bringing a new facility online, we'll reduce our security posture.

Then the most important thing, perhaps, is—of course, any delay in a project ultimately costs you money. So, if we delay the start and the process of this facility, it means, in the end, the integrated costs—although in 1 year you might save money, over the life of the project, it's going to cost you money.

So, I think those are some of the difficult challenges that Congress has to face. I think the simple version is, if you think of this in a project space, saving money this year may well cause you to spend more money in the long run.

The other pieces we've harped on are—or, not harped on, but emphasized with you—is the people issue. Right now, our workforce sees pay freezes, sees increased contributions to pensions, increased costs of medical care, and now an uncertain budget. They've been very excited about the new commitment that the country has made. There's exciting consensus to work on. But, at the same time, these uncertainties make the younger ones start to wonder, is there a career here for them? We understand the challenges that the country faces, but if we can have a stable-looking budget out into the years, whatever level it's at, whatever the country can afford—and if it's too different than the one we've talked about, ultimately I think we have to go back to the policy and say, "If the country can't afford this program, then perhaps we have to go rethink the policy and come up with a policy framework that the country can afford." I'm not sure I know what that is, but that's the sort of challenge that you face.

Thank you, sir.

Senator NELSON. Thank you.

I'll ask the same question of everyone else. Is there something that we should have asked, or something you would like to add, after all the discussion so far?

Dr. Hommert?

Dr. HOMMERT. I have a few quick comments.

Just to continue a theme that Dr. Anastasio highlighted about cost efficiencies and our sensitivity to that. At Sandia, in the last year, we took decisions in our pension and our medical benefits and in cost efficiencies that have reduced the cost of our labor base by approximately $1 billion over this decade. The positive news in that is that our workforce has gone through that. They remain dedicated. We did not see an uptick in losses due to that, in part, because of their excitement about the program that they see the national policy laying out in front of them. So, again, I echo that, if that changes, that could have a different impact.

Then, the last thing I'll say is to return to, I think, really the question that Senator Sessions raised about, Well, what are our options if we cannot afford? I'll focus it on the B61 for a moment. It's important to understand that every day—that the 61 is older than any other bomb system we've ever had. We're in unchartered territory. It—whatever budget the country can afford, our commitment is that we will work to minimize risks of sustaining that weapon and ensuring its safety, security, and reliability. But, there'll be limits to how much we can control that risk, either in schedule or in the scope of what we do. It will require a possible relook at policy. I hope that won't be the case. We will work diligently to extract every bit of efficiency for the funds you can authorize to execute that. But, it is a bit, again I'll emphasize, of uncharted territory for us on that weapon system.

Thank you.

Senator NELSON. Thank you. That is clearly something we have to keep in mind. The irony is inescapable, that a year ago we were making certain that the administration would ask for enough money. Now we're talking about—it's too much, because we can't afford it. It's an inescapable irony. I do understand it. I would imagine that employees and those who are committed to the project might think that Washington has a bit of a sleight of hand: now you see it, now you don't.

Thank you all for your candid comments. We appreciate it.

This hearing is now adjourned.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR E. BENJAMIN NELSON

SAFETY OF NAVAL NUCLEAR REACTORS

1. Senator NELSON. Admiral Donald, the Nuclear Navy has had an exemplary safety record over its almost 60 years of operations. Nevertheless, the recent events in Japan, a country with as much expertise in nuclear power as anyone, have taught us that even redundant redundancies can fail. What actions are you taking to reassure yourself that appropriate emergency contingencies and plans are in place and that these contingencies would avert a tragedy?

Admiral DONALD. There are no immediate changes planned to how U.S. naval reactors used onboard submarines and aircraft carriers are operated as a result of the Fukushima nuclear power plant failures. However, as we have done in response to other major accidents, nuclear or otherwise, the U.S. Navy will assess and implement lessons learned from the event that can be applied to further strengthen the U.S. naval nuclear propulsion program. I have already initiated an assessment of the implications of the Fukushima reactor accident to the Naval Nuclear Propulsion Program.

U.S. nuclear powered warships have safely operated for more than 50 years without experiencing a single reactor accident or release of any radioactivity sufficient to harm human health or have an adverse effect on the environment. U.S. naval

reactors have an outstanding record of over 146 million miles safely steamed on nuclear power, and they have amassed over 6,300 reactor-years of safe operation.

Because of their military-unique missions, naval reactors are significantly different from commercial nuclear reactors. All nuclear powered warships are designed to survive wartime attack and allow the warships to continue to fight while protecting their crews against hazards. Survivability requires rugged designs, well-developed damage control capabilities, and redundant systems that also provide enhanced safety capability in the event of natural disasters.

The earthquake and subsequent tsunami in Japan caused an extended loss of electrical power which resulted in the inability to properly cool the reactor cores at the Fukushima Daiichi site. Unlike the Fukushima nuclear power reactors, U.S. naval reactors have long-term decay heat removing capability that depends only on the physical arrangement of the reactor plant and on the nature of water itself (natural convection driven by density differences), not on electrical power, to cool the core. This is one example of the means available to nuclear-powered warships that assure, even in the unlikely event of multiple failures, naval reactors would not overheat and the fuel would not be damaged by heat produced in the reactor core.

Further, there are multiple barriers that work to contain radioactivity on nuclear powered warships. Naval nuclear fuel contains fission products and prevents their release into the coolant loop during normal operations. Although commercial power reactors have similar barriers, barriers in nuclear powered warships are more robust, resilient, and conservatively designed. For example, U.S. naval nuclear fuel is solid metal, unlike the ceramic nuclear fuel used in commercial power reactors. U.S. naval nuclear fuel is designed for battle shock and can withstand combat shock loads 50 times the force of gravity without releasing fission products. This is greater than 10 times the earthquake shock loads used for designing U.S. commercial nuclear plants.

Notwithstanding the enhanced capability of nuclear powered warships to survive natural disasters and continue to operate safely, other factors serve to mitigate the impacts of natural disasters on these ships. The fact that a moored nuclear powered warship sits in the water serves as a buffer against the ground forces felt during an earthquake; the earthquake forces on a moored nuclear powered warship, even those like the March 11 earthquake, would not be severe.

Commercial nuclear power plants are designed to operate at high power levels for long periods to produce electricity. Because naval reactors are designed for warships, they are smaller and have a much lower power rating than commercial reactors. The rated power levels of the largest naval reactors are less than one-fifth of a large commercial reactor plant. Additionally, naval reactors typically operate at a fraction of their full power levels, since ships usually operate at speeds less than their maximum. Furthermore, because naval reactor power level is primarily set by propulsion needs when the ship is at sea, naval reactors are normally shutdown shortly after mooring and they are usually started up only shortly before departure. As a result of these facts, the amount of radioactivity potentially available for release from a reactor core of a U.S. nuclear powered warship moored in a port is typically less than about 1 percent of the levels for a typical commercial reactor. Naval cores also have significantly less heat buildup from fission product decay to be cooled when the reactors are shutdown. In addition, the reality that nuclear powered warships can be moved is a safety option that is not available to land-based nuclear facilities.

U.S. nuclear powered warship crews are rigorously trained to respond immediately to any emergency in the ship. Naval operating practices and emergency procedures are also well-defined and rigorously enforced. The fact that the crew works in close proximity to the reactor ensures vigilant monitoring of even the smallest change in plant status. This is part of what we call "Defense in Depth" and is an element of our overall culture of maintaining high standards for design, manufacturing and operations—addressing small problems aggressively before they become larger ones. Because of the rugged design of the reactor plant, multiple safety systems, and fully trained and capable crew, the safety of U.S. nuclear powered warships is extremely high. In order for an accident that affects the operation of the ship or the crew to happen, the ship must simultaneously experience numerous unrealistic equipment and operator failures. Even though such an accident scenario is extremely unlikely, the U.S. nuclear powered warships and their support facilities are required to simulate such situations as they conduct meaningful training. In the extremely unlikely event of a problem involving the reactor of a U.S. nuclear powered warship, the U.S. Navy would initiate necessary actions to respond to the situation and could call on other U.S. national response assets if necessary.

2. Senator NELSON. Dr. Anastasio, Dr. Miller, and Dr. Hommert, what have each of you done to ensure that your emergency contingencies and plans are adequate, and that they will operate as designed to avert a nuclear incident at any of the nuclear facilities at your labs?

Dr. ANASTASIO. Los Alamos is committed to maintaining the highest safety standards at all of its facilities. All Los Alamos National Laboratory (LANL) nuclear facilities are required to have an in-depth safety analysis in place that reviews postulated accident scenarios and puts in place appropriate controls to prevent and mitigate such situations. This includes very severe scenarios which can include a combination of events, such as a large seismic event coupled with a facility-wide fire which is the most severe event postulated for the plutonium facility at LANL. As a result of these analyses, LANL has initiated a series of safety improvement activities to address identified issues such as implementing: strict controls over combustible materials to reduce the chance of a fire; seismic cut-off switches for electrical power to non-safety systems to eliminate a seismically-induced electrical fire; repacking nuclear material into robust containers to survive appropriate impacts and fires; upgrading the fire suppression, air handling and filtration systems, and storage infrastructure, and minimizing the nuclear material that is being processed at any given time. Additionally, in 2007 LANL adopted an updated site-wide seismic hazard analysis standard which incorporates new geologic data. Since that time, LANL has been conducting detailed structural analyses of its nuclear facilities using this updated hazards to identify potential structural issues that would result from a large seismic event. LANL is now completing these analyses and has identified some additional areas that will be reinforced to improve performance.

For the 3 active nuclear facilities (WETF, CMR, and PF–4) 11 drills and/or exercises were conducted last year. Each drill/exercise is evaluated and observations are documented to develop lessons learned to be shared with response, operations, facilities, and programmatic science staff. We also include first responders from the community to participate in these drills. All issues are tracked and corrected per the site corrective actions process.

With regard to emergency response, each facility or facility complex at LANL has a written plan that evaluates the response in the event of an accident and describes the specific actions to be taken for each potential scenario. Last year LANL performed over 45 drills and exercises designed to test the responses to a variety of accident scenarios such as spills, fires (including Wildland fire), criticality accidents, severe personnel injuries, transportation accidents, and facility-specific events.

Dr. MILLER. Safe and secure operations are a top priority at Lawrence Livermore National Laboratory (LLNL). We have comprehensive programs to protect the health and safety of our workforce and rigorous policies governing conduct of operations to ensure the safe operation of our high explosives and nuclear facilities. These critical activities are funded by the National Nuclear Security Administration's (NNSA) Readiness in Technical Base and Facilities (RTBF) program. Finally, we constantly review ourselves to keep up with best practices and welcome the oversight provided by the NNSA in this area.

Nuclear safety at the Laboratory is vigorously pursued and continually reviewed against a wide variety of accident scenarios to ensure we take a very conservative approach to protecting the environment, our workers, and the public. Routine nuclear safety operations include:

- Frequent review of operations protocols. LLNL's continuity of operations program was reviewed and updated in 2010 to consider catastrophic events.
- Current safety documents analyze operational hazards, hazards from external events, and natural phenomena hazards to determine which safety systems would be required to stay operational during such events. Comprehensive maintenance and testing programs ensure continuous operability. Consistent with Federal regulations, safety documentation is continuously reviewed by LLNL and U.S. Government oversight organizations to ensure that, as changes are made or new information received, hazards are evaluated and appropriate reliable controls are maintained to avert nuclear incidents.
- Critical safety systems (e.g., those safety systems relied upon to protect the general public) are intentionally redundant by design for selected active components, and fail-safe modes are designed with seismic and other credible natural phenomena hazards in mind. These systems are examined frequently to ensure their functionality and operability.

Dr. HOMMERT. Sandia National Laboratories has two nuclear research reactor facilities: The Annular Core Research Reactor (ACRR) and the Sandia Pulsed Reactor

Facility/Critical Experiments (SPRF/CX). The ACRR is an open-pool research reactor, similar to those used at universities with capability for Pulse and Steady-State Operation. It is used to support Sandia National Laboratories' Nuclear Weapons Strategic Management Unit stockpile stewardship activities and external customers. SPRF/CX is a laboratory scale research reactor used to explore the physics of commercial nuclear reactors.

The nuclear facilities were examined pursuant to Department of Energy (DOE) Safety Bulletin 2011–01, "Events Beyond Design Safety Basis Analysis" issued by Secretary Chu on March 23, 2011. The review showed that the time-integrated fission power associated with ACRR and SPR–CX is sufficiently low to preclude the need for electrical power for post-emergency core cooling or any other safety system action. The review also found that radionuclide inventories at the facilities are so low that safety class systems are not required. Public and worker consequences for the full spectrum of accidents have been extensively analyzed in previously approved safety documents. Emergency response plans were also reviewed. Sandia is participating in the DOE-wide lessons-learned process to identify specific and systemic safety gaps and mitigate any gaps discovered. To date, Sandia has not identified any significant gaps in hazard protections or emergency response that would require immediate actions to ensure the safety of the public, workers or the environment. Nevertheless, Sandia continues to emphasize worker and public safety and continuously improve our emergency preparedness procedures. We are working to guard against complacency.

HEALTH OF THE LABORATORIES

3. Senator NELSON. Dr. Anastasio, Dr. Miller, and Dr. Hommert, as I mentioned in my opening statement, there was a lot of discussion on the amount of weapons funding for the labs during the New START treaty debate. What was not discussed much is the breadth of the work that the labs carry out, beyond weapons work, and how this non-weapons work is a key element in maintaining world-class science and engineering. Could each of you describe the percentage of your lab's annual budget that is nuclear weapons activities, and describe the work that comprises the balance of the budget and why this work is important?

Dr. ANASTASIO. LANL's core mission is to ensure the continued safety, security, and effectiveness of the Nation's nuclear deterrent. Los Alamos is more broadly a national security science laboratory. Engaging in this broader work is vital to the long-term health of the Laboratory and to our ability to address future national security missions. In fiscal year 2011, 56 percent of our operating budget is NNSA weapons program activities, 7 percent is associated Safeguards and Security, 9 percent is NNSA nonproliferation funding, 8 percent of our budget is from DOE environmental management (for cleanup activities), 7 percent is from DOE science and energy programs, and 13 percent is work for other agencies, the majority of which are other Federal national security agencies (Department of Homeland Security (DHS), Department of Defense (DOD), and the Intelligence Community).

Much of the non-weapons work is still associated with nuclear security and leverages directly on expertise developed to sustain the Nation's deterrent. Essentially all of the non-weapons activity is at Los Alamos because of sponsor selection, i.e. whether Los Alamos is the sole provider or part of a team with other labs, a sponsor made the decision to fund this activity rather than others. Those activities make important, often critical contributions to national interests.

While the core nuclear weapons program provides a majority of the capabilities (both scientific and personnel), these broader scientific security missions allow LANL to sustain and develop the science, technology, and engineering that enable us to respond to unplanned technical challenges both now and into the future. As an example, last year our staff experienced in radiography was able to immediately deploy to the Gulf of Mexico to quickly develop a new capability to x-ray the Deep Water Horizon blow out preventer. At more than a mile beneath the ocean surface, we provided imagery using a sealed source to help national decisionmakers better understand what was occurring inside that device.

In addition, engagement with this broad range of different challenges helps extend key science, technology, and engineering at Los Alamos that is essential to our long-term core mission. Competitive selection and awards also help demonstrate to allies and potential adversaries that our technical capabilities remain world-class. Finally, the open science at Los Alamos supports a strong student and postdoctoral research program that is essential for our pipeline of the Nation's top science and engineering talent. Last year, Los Alamos hosted over 1,300 summer students, as one example.

Dr. MILLER. The NNSA laboratories have exceptional staff covering a broad range of scientific, technical and engineering capabilities-as well as unique, world-class facilities, which are leveraged to develop innovative solutions to major 21st century challenges in nonproliferation, intelligence, defense, homeland security and counterterrorism, and energy technology and climate science.

Nonproliferation

With globalization and worldwide interest in expanding nuclear power, proliferation challenges are evolving and covering a wider geographic area. LLNL has made important contributions to NNSA's mission in monitoring for signatures of proliferation activity, addressing problems posed by legacy materials and capabilities in the Former Soviet Union (FSU), providing technologies and experts to enhance nuclear safeguards through the International Atomic Energy Agency, and engaging with the international community to promote U.S. Government nonproliferation goals and objectives. Nonproliferation activities have broadened to address new regional challenges beyond the FSU through international cooperation and engagement and through enhanced monitoring and detection technologies. This work provides the technical basis for expanding the benefits of nuclear power without expanding the nuclear threat.

An example of LLNL contributions to nuclear signatures detection is nuclear explosion monitoring. For more than a decade, LLNL seismologists have used available seismic data to develop empirical corrections to seismic event processing algorithms to adjust for specific source and monitoring station location. Today, with high-performance supercomputers, seismologists can capture three-dimensional earth structure to calculate these corrections with physics-based models for any source-receiver pair. This will enable more precise detection, location, and identification of explosions, potentially anywhere on the globe, and even at the low energy releases that might occur from a weapon development test. Development of new monitoring methods with three-dimensional earth models can proceed using current supercomputer capability, however, exacale computing is required to make these new techniques operational. Exascale computing will not only improve our country's ability to monitor nuclear explosions but will also allow researchers to better define seismically active faults where small earthquakes may occur.

Intelligence

The NNSA laboratories have a long and distinguished history of support to the Intelligence Community. The LLNL intelligence program is strongly focused on the activities of nuclear-capable states, unsafeguarded and clandestine programs and terrorist groups, cyber threats and countermeasures, and biological and chemical weapon development and deployment efforts. LLNL's intelligence support relies on our diverse, multidisciplinary professional staff, drawing in experts from across the Laboratory. For example, several insights and advances in the cyber security program have been informed by experience gained through LLNL's high-performance computing efforts. The contributions of the NNSA laboratories cut across the entire spectrum of the U.S. Government's efforts in prevention, deterrent, defense, consequence management, and related areas where detailed technical knowledge provides decision advantage.

The Counterproliferation Analysis and Planning System (CAPS) is an example of decision support that LLNL has provided military planners for actual and potential operations against over 37,000 facilities that support or could support the production of weapons of mass destruction (WMD). CAPS is used by over 1,500 planners and operators on a daily basis. Chosen in 1998 by then Secretary of Defense Cohen to be the preferred planning tool for use by U.S. Armed Forces to combat WMD, CAPS has played a significant role in supporting operations during the Kosovo conflict, Operation Enduring Freedom, and Operation Iraqi Freedom. CAPS engineers provide in-depth assessments of WMD facilities to include isolating critical nodes, assessing the potential for collateral damage from interdiction attempts, and quantifying those signatures that can reflect real-time operations under way at selected sites. The engineering staff at CAPS also provides a daily technical reach-back capability that responds to hundreds of requests for assistance from troops presently engaged in combat.

Defense

For more than 6 decades, our military has benefitted from the depth and breadth of integrated, systems-level solutions developed at the NNSA laboratories. Beyond stewardship of the Nation's nuclear stockpile, the three NNSA laboratories provide high value to DOD in munitions, explosives science and engineering, and conventional weapons design; directed energy systems; cyber and network sciences; intelligence, surveillance, and reconnaissance; operational warfighter support; countering

the nuclear threat; nuclear weapons effects predictions and analysis; countering the chemical and biological threat; and space systems. Two examples of defense missions where LLNL is currently engaged are:

Third Generation Conventional Munitions: The Laboratory was tasked by DOD to develop a next generation conventional munition with a more precise lethal radius, thus significantly mitigating collateral effects concerns in close air support or peacekeeping operations. We successfully combined and applied our high explosives expertise with our unique understanding of case materials and our High Performance Computing (HPC) capability to model and simulate the new munition, resulting in a significantly reduced concept to product timeline (10 months from concept to qualifications testing), providing the warfighter with a focused lethality weapon.

The Diode Pumped Alkali Laser (DPAL): Sponsored by DOD, DPAL is a leap-ahead technology that will provide a laser that is up to 500 times more lethal per kilogram than any other currently demonstrated or contemplated laser weapon, thus enabling the deployment of high energy laser capabilities on a broad array of platforms. These advances take advantage of LLNL's rich history of laser science and technology development.

Homeland security and counterterrorism

The NNSA laboratories' role in homeland security and counterterrorism began nearly 30 years ago with the formation of the Nuclear Emergency Search Teams (NEST) and related nuclear threat assessment activities. Today, LLNL's efforts cover a wide range of programs and sponsors, from threat and risk assessments, to detection of threat materials, to understanding and mitigating the consequences of attacks, to forensic analysis, to aiding in the attribution of responsibility for WMD attacks. Our work encompasses chemical, biological, radiological, nuclear, and high-explosive threats. Today's programs take advantage of significant historical investments by the NNSA in key infrastructure and most importantly in our multidisciplinary technical staff. Together these capabilities provide a major component of the Nation's defenses against the catastrophic threat posed by the malicious use of weapons of mass destruction.

An example of LLNL support for homeland security and disaster response is the National Atmospheric Release Advisory Center (NARAC). NARAC has been on call since the Three Mile Island incident of 1979. NARAC can deliver an initial prediction to Federal, state, and local responders of the fate and atmospheric transport of hazardous materials for almost any kind of release in 5 to 15 minutes; it responds to roughly 25 events in a typical year (and simulates, for the purpose of exercises, 10,000 more). Right now, NARAC is applying LLNL's computing capabilities in support the U.S. response to recent events in Japan. As the hub of the Department of Homeland Security's Interagency Modeling and Atmospheric Assessment Center (IMAAC), NARAC also provided plume predictions of the fire on the Deepwater Horizon oil platform and forecast the particulates that might be released from surface-oil burns. NARAC and IMAAC are unique capabilities to the Nation that take advantage of LLNL's expertise, and exceptional computational and modeling capabilities.

Energy technology and climate science

The NNSA laboratories develop and deploy science, technology, and operational protocols to increase utilization of our Nation's large and secure Reserves of conventional and unconventional fossil fuels while safely reducing carbon dioxide emissions through innovations in carbon capture and long-term geologic sequestration. In addition, the NNSA labs have made seminal contributions to climate science, including participation in the Intergovernmental Panel on Climate Change. At LLNL, scientists are working on programs to expand the use of renewable energy through innovative technology, improved efficiency, new resources, systems integration, and reduced costs; deliver climate simulations at the regional scale to understand the critical processes that drive climate change; develop advanced nuclear fuels and reactor systems that are proliferation-resistant and provide for expanded safe, secure, carbon-free, cost-competitive nuclear power; and provide science and advanced technology needed to effectively store nuclear waste for long times or eliminate the nuclear waste altogether. Specific examples of LLNL efforts in energy and climate are:

Energy, Water, and Carbon Dioxide Flow Diagrams LLNL specialists produced the first diagrams illustrating U.S. energy use. Portraying U.S. energy resources and their ultimate use, these diagrams, called energy flow charts, help scientists, analysts, and other decisionmakers to visualize the complex interrelationships involved in powering the Nation. Today, flow

diagram concept has been extended to cover water use and carbon dioxide emissions, in reports that separately cover the 50 states and 136 countries.

The Program for Climate Model Diagnosis and Intercomparison (PCMDI): Established in 1989, LLNL's DOE-sponsored PCMDI is an internationally recognized research group that focuses on understanding climate change and analyzing and diagnosing the performance of climate models. The climate research community relies on PCMDI to help organize and manage internationally-coordinated modeling studies. Through a PCMDI-led federated alliance of major data centers, output from the world's climate models is made freely accessible to thousands of researchers who evaluate the models and analyze their projections of future climate change. This widespread scrutiny of climate models is accelerating advancement of climate science and provides a multi-model perspective that has been a basis for reaching robust conclusions in major assessments of climate science (e.g., the reports of the Intergovernmental Panel on Climate Change).

FUNDING SUMMARY

	Fiscal Year 2010 Percent Funds In	Fiscal Year 2011 Percent Funds Anticipated
Nuclear Weapons	64	66
Nonproliferation	6	6
Defense and Intelligence	14	13
Homeland and Counter Terrorism	7	7
Energy Technology and Climate Science	4	4
Other Basic Science	5	4
	100	100

Dr. HOMMERT. Nuclear Weapons activities are Sandia's core mission, and in fiscal year 2011, comprise 47 percent of our total budget. We have other important missions that address a broad spectrum of U.S. national security needs. These other mission areas include Defense Systems and Assessments (30 percent); Energy, Climate and Infrastructure Security (12 percent); and, International, Homeland and Nuclear Security (11 percent).

Our work in these other mission areas has direct national security impact for our customers, and is conducted in a way that is mutually reinforcing of the capabilities and competencies required for our core nuclear weapons mission. Often a unique Sandia capability is leveraged to address common or similar interagency needs. For example, in fiscal year 2011 the $44 million investment by the nuclear weapons program in our microelectronics/microsystems capabilities enables $119 million in project work for a number of national security agencies.

4. Senator NELSON. Dr. Anastasio, Dr. Miller, and Dr. Hommert, if as set forth in the Continuing Resolution (CR), the funding for the nonproliferation programs of the NNSA is at or slightly above the fiscal year 2010 levels, does this also impact the health of the labs?

Dr. ANASTASIO. NNSA's office of defense nuclear nonproliferation performs critical science for national security, drawing upon the entire national R&D enterprise. These programs solve problems associated with very real threats against the Nation. The capabilities and expertise that support these programs require substantial long-term investment. NNSA's nuclear nonproliferation budget has increased from $2.13 billion in fiscal year 2010 to an estimated $2.27 billion in fiscal year 2011, after rescissions. The administration's fiscal year 2012 request of $2.54 billion demonstrates a commitment to harness the power of technology to address real challenges in nonproliferation research and development. Technological advances such as next generation nuclear detection capabilities and methods to detect foreign nuclear materials and weapons production facilities and processes are among the advances gained by investment in this area. We are working within the bounds of the current appropriation, but budgetary cuts would severely limit science and technology momentum against constantly evolving terrorist threats.

Dr. MILLER. As the question points out, the NNSA's Defense Nuclear Nonproliferation total budget under the Continuing Resolution for the rest of fiscal year 2011 is slightly above the fiscal year 2010 appropriation. Because of uncertainties in some large budget items at other NNSA sites (the Satellite Program and the National Center for Nuclear Security), the Nonproliferation R&D budgets for activities

at LLNL and other laboratories currently are significantly less than their fiscal year 2010 levels. Assuming the successful resolution of those uncertainties we expect to receive approximately the same amount of funding in our nonproliferation programs as last year, but we will likely receive it late in the year. We are planning now to make sure that these late-arriving funds are obligated against our programmed deliverables.

Dr. HOMMERT. The funding for nonproliferation programs under the CR does not currently impact the health of Sandia. However, if funding is sustained at these levels in the out years, or if the amount of funding that Sandia receives from NNSA is decreased from current levels, an erosion of capability will occur at Sandia, both in the quality of staff and, more significantly, their experience. This will negatively impact the Nation's ability to obtain critical technical support for addressing current treaty obligations and objectives as well as for accomplishing key policy objectives in future negotiations.

5. Senator NELSON. Dr. Anastasio, Dr. Miller, and Dr. Hommert, is the same true for reductions in science funding for DOE as well as reductions at DHS?

Dr. ANASTASIO. DOE is the largest funder of physical science in the United States, and support at Los Alamos in science is essential to the health of our open, peer-reviewed science and key experimental user facilities. DHS is also an important sponsor at Los Alamos. This funding allows Los Alamos to develop prototype technologies that leverage our innovations to protect the public from threats to the homeland. These non-weapons programs serve to both attract top scientists to the laboratory and build up fundamental scientific capability that can be further leveraged and applied to LANL's core weapons program work. Depending on the level of cuts in these programs, the impact on the Laboratory and the Nation could be significant. We recognize that funding for these and other agencies is constrained and in each case we work with the sponsoring programs to offer those agencies excellent technical options to address their mission priorities within the available budget.

Dr. MILLER. Impact on projects funded from the DOE Office of Science (SC) is not known for certain at this time. However, the reductions to the SC budget appear to be small. Specific impacts will depend on how the available budget is allocated throughout the DOE laboratory complex.

SC program provides funding for the following LLNL R&D activities:

- Fusion Energy Sciences - research in experiments, theory, and modeling in magnetic fusion energy science; high energy density laboratory plasmas; and fusion technology and materials.
- Advanced Scientific Computing Research - development of advanced numerical methods for solving complex physics applications on high performance computers, basic research on the tools and methods necessary to allow scientists to effectively use the current and next generation of high performance computers, and technologies that increase our insight and understanding into massive scientific data sets. This research is particularly synergistic with LLNL NNSA missions and long-term strategic objectives; particularly as they pertain to the development and use of simulation and exascale computing environments.
- Biological and Environmental Research - includes analysis of different climate models; the Program for Climate Model Diagnosis and Intercomparison, which is an internationally recognized research group at LLNL that focuses on understanding climate change, developing assessment methods and maintaining large data bases widely shared by the climate modeling community, and analyzing and diagnosing the performance of climate models; research on cloud and aerosol physics and atmospheric chemistry; microbial systems biology relevant to both biofuel development terrestrial carbon sequestration; the biogeochemistry of the subsurface reactive transport of plutonium; and the development of an artificial retina. These programs lie at the scientific core of the LLNL's mission to advance the energy and environmental security of the Nation.
- Basic Energy Sciences - fundamental investigations in the fields of materials science, chemical sciences, geosciences, and biomaterials. This includes research efforts in the areas of materials science at ultrafast timescales, actinide science, radiation-resistant materials for advanced energy applications, nanoscale materials science, and materials characterization for geosciences. This work is aligned with the Laboratory's long-term strategic objectives in support of national and energy security mission needs.
- High Energy Physics - includes fundamental research in advanced detector development, dark matter searches, the properties of neutrinos and the

search for the Higgs and supersymmetry, as well as theoretical investigations of physics beyond the standard model. The scientists engaged in this research apply their skills and expertise across the span of programmatic work at LLNL which include nonproliferation, stockpile stewardship, homeland security, the National Ignition Facility (NIF) and the HPC facilities.

• Nuclear Physics - fundamental research in a broad range of topics including theoretical work spanning the range from quantum chromodynamics, to ab initio nuclear structure and reaction theory, to fissioning heavy nuclear systems. Experimental efforts include neutrinoless double-beta-decay searches, the elucidation of nuclear structure off of stability, and the study of relativistic heavy ion collisions at both the Relativistic Heavy Ion Collider and the Large Hadron Collider. These programs complement the national security work; the same scientists support homeland security activities in attribution, stockpile stewardship and the NIF.

Department of Homeland Security

Details on the budgetary impact to LLNL's fiscal year 2011 funding from the DHS are still unknown at this time. Current funding to LLNL from DHS S&T is about $48 million, and DHS S&T's budget for research and development has been reduced by about 20 percent from fiscal year 2010. While DHS S&T has yet to make key decisions on their R&D priorities for fiscal year 2011, LLNL expects some changes in priorities from their original plan that might result in reductions to LLNL's R&D program.

LLNL has ongoing scientific and engineering projects in several important areas including explosives/aviation security, bio detection and bio forensics, bio threat awareness, chemical agent science and chemical forensics, response and recovery, and transit infrastructure protection.

Examples of LLNL DHS funded research include:

• Explosives/Aviation Security: LLNL's scientists and engineers support a broad range of research and development programs in explosives and aviation security including: understanding the properties of homemade explosives, developing detection technologies for aviation security applications including both passenger check point and checked baggage screening, testing of screening technologies in support of TSA's technology acquisition programs, and modeling and simulation of aircraft vulnerabilities to a broad range of homemade explosive threats. These R&D programs are critical to the development and deployment of effective aviation security technologies at our Nation's airports.

• Biodetection and Bioforensics: LLNL's biosecurity research and development programs include: development of biodetection signatures to detect virulence genes in multiple biological pathogens, development of underlying technologies to support Gen-3 biowatch, development of integrated bioforensics database to support bioforensics analysis, and operation of the DHS BioKnowledge Center, which is focused on providing a deep understanding of the risks and countermeasures associated with current and future bio threats.

• Chemical Agent Science and Chemical Forensics: LLNL's chemical security programs include: development of comprehensive understanding of the fundamental mechanisms of chemical agents including novel threat agents and development of an integrated experimental and high-performance computing-based modeling capability to predict the effects and degradation of chemical agents. These R&D programs are critical to mitigating the impact of future chemical weapons-related terrorist events.

• Weapons of Mass Destruction (WMD) Restoration Projects: LLNL brings unique technical capabilities and operational experience to multiple WMD restoration projects. These programs support critical partnerships with multiple Federal, state and local agencies as they work to improve our Nation's resiliency and facilitate the recovery from a WMD attack.

DHS, DOE and NNSA have made significant investments in LLNL's infrastructure dedicated to Homeland Security S&T challenges. Unique facilities for explosives research, development, test and evaluation are in place at LLNL to ensure the development and assessment of the effectiveness of the current and next-generation of explosives screening technologies designed to counter the emergent threat of home-made explosives (HMEs). This infrastructure is critical to supporting TSA's acquisition of screening technologies for aviation security. In addition, LLNL operates the only select-agent research facility at the BSL–3 level at the DOE national laboratories. This capability is fundamental to our understanding of human pathogens and enables research and development in their detection, characterization and

post-event remediation. LLNL also has the safe and secure infrastructure needed to synthesize and characterize small quantities of chemical weapons including novel threat agents. This secure research and development environment is critical in developing a predictive capability for mitigating the impacts of novel chemical weapons agents.

Dr. HOMMERT. Based on the final fiscal year 2011 budget that was passed by Congress and signed by President Obama, Sandia's budget for Office of Science activities is expected to be $55 million, a reduction of ~$6 million or roughly 10 percent from the fiscal year 2010 level. This will reduce our ability to pursue research in areas of Basic Energy Sciences, Advanced Scientific Computing Research, and Fusion Energy Sciences. Our research in these areas creates the ideas and future innovations for advanced energy technologies and national security applications, and supports the overall health of the laboratories. While we realize that the Nation is in a difficult budgetary period, a reduction in our science budget makes it difficult to attract and retain the best and the brightest of the Nation's scientists and engineers, and this puts at risk our support of critical national security needs.

The fiscal year 2011 budget of $688 million for the DHS Science and Technology (S&T) Directorate reflects a reduction of 20 percent relative to the fiscal year 2010 level of $863 million. Because DHS S&T has not yet fully distributed these cuts across existing or planned programs, specific impacts are not yet known. Our current assumption is that Sandia will receive a proportional negative budget impact of approximately $5 million.

Looking forward, the new fiscal year 2012 House spending bill approved by the House Appropriations Homeland Security Subcommittee on May 13, 2011, includes an additional 40 percent cut to DHS S&T. While these cuts are not at a scale to impact the overall health of Sandia, they will have enormous negative implications on the ability of the United States to reap the operational benefits of innovative new technologies in the homeland security arena.

URANIUM PROCESSING FACILITY AND THE PLUTONIUM LABORATORY

6. Senator NELSON. Mr. D'Agostino, the Uranium Processing Facility (UPF) in Tennessee, and the new plutonium facility, the Chemical and Metallurgical Research Replacement (CMRR) facility at the LANL, are technically complex, new, multi-billion facilities. These are also the last two large, new facilities slated for the weapons complex, completing a plan put in place almost 20 years ago to modernize major production and research facilities. In November of last year, the Government Accountability Office (GAO) issued a report on the UPF, which made several recommendations specific to the UPF, but was also applicable generally to NNSA management of large construction projects. One of the issues raised by GAO was the maturity of new technologies. GAO's view is that prototypes of new technology should be successfully demonstrated in an operating environment prior to the start of construction. This level of maturity is a Technical Readiness Level 7 (TRL–7) on a scale of 1 to 10. This scale is widely used by DOD. Will the new technologies at the UPF and the CMRR be at a TRL–7 as recommended by GAO at the start of construction of UPF and CMRR? If not, why not?

Mr. D'AGOSTINO. NNSA continually monitors and evaluates technology readiness levels for new processes in UPF in alignment with best practices as identified in the GAO review. The UPF project is being planned and executed in accordance with the recently updated DOE Order 413.3B, Program and Project Management for the Acquisition of Capital Assets, which requires significant critical technology element modification subsequent to CD–2. NNSA is encouraging achievement of a TRL–7 prior to CD–3 as a recognized best practice. However, in instances where a lower readiness level of development is acceptable, because of our robust understanding of the technology, we will recognize the risks of proceeding with demonstrating the technology at the next lower level and ensure appropriate contingencies are identified.

DOE agrees that achieving TRL–7—demonstration of a prototype in an operational environment—is a level of technological maturity that constitutes low risk for starting a product development program but has determined that Technical Readiness Assessments coupled with Technology Maturity Plans are also an acceptable way to manage and mitigate technology risk when there are very low quantities of each type of technology. In contrast to DOD's air, sea and sub-surface weapons platforms, where large production quantities of new critical technologies must operate in mobile, extreme and very dynamic environments, UPF technologies exist only in UPF, are stationary and will operate in a stable, known environment. Further, demonstration with actual Special Nuclear Material in an operational environ-

ment would require construction of essentially the final system. For these reasons, a lower technology level (TRL–6, demonstration of prototype with simulate material in an operational environment) is acceptable in this instance, given the cost/benefit associated with further development of each individual new technology. Appropriate rationale and contingency will be incorporated into the baseline where a project technology is short of TRL–7.

7. Senator NELSON. Mr. D'Agostino, you have committed to having the design for the UPF and the CMRR 90 percent complete before the construction project baseline for cost and schedule is established. Under the DOE construction management order, construction projects must receive senior level approval at certain critical decision (CD) milestones. These milestones are CD–0, CD–1, etc. CD–2 is the milestone where the cost and schedule baseline is established. CD–3 is the start of construction. At which milestone will the cost and schedule baselines be set for UPF and CMRR?

Mr. D'AGOSTINO. The cost and schedule baselines for UPF and CMRR will be set at the CD–2 milestone. NNSA has committed to having UPF and CMRR projects at a minimum 90 percent design completion prior to seeking CD–2. NNSA will have greater confidence and less risk of exceeding performance baselines with this advanced level of maturity in design at CD–2. Both projects are currently planning to request CD–2 approval for the full project scope in fiscal year 2013.

8. Senator NELSON. Mr. D'Agostino, will NNSA do an Independent Cost Estimate (ICE) for each project before CD–2?

Mr. D'AGOSTINO. Yes. In accordance with DOE 413.3B, an External Independent Review (EIR) is required as part of CD–2 approval. For projects such as UPF and CMRR that are greater than $100 million, an ICE is a required component of the EIR and must validate the proposed total project costs. The EIR, conducted by the Office of Engineering and Construction Management (within DOE, but accountable to the Secretary and completely independent of the NNSA), must validate the proposed scope, cost and schedule baselines as a condition of CD–2 approval.

9. Senator NELSON. Mr. D'Agostino, in the National Defense Authorization Act (NDAA) for Fiscal Year 2011, there is a provision, section 3114, which requires NNSA to report to Congress when the baseline is established for a major project. From that baseline, Congress and the NNSA will measure progress. Will CD–2 serve as the baseline for purposes of section 3114?

Mr. D'AGOSTINO. Yes, the baseline will be approved at CD–2 for the purposes of Section 3114 of the NDAA. CD–2 is the milestone where project scope, cost and schedule baselines are established and approved by the Acquisition Executive.

10. Senator NELSON. Mr. D'Agostino, GAO also recommended that once the baseline cost and schedule is established, the NNSA Administrator must ensure that the baseline is "consistent with NNSA's future years budget and spending plan prior to approval of . . . critical decision 2." Will GAO's recommendation be followed for the UPF, CMRR, and the new Naval Reactors Expended Core Facility (ECF)?

Mr. D'AGOSTINO. NNSA will establish budget requests and spending plans for UPF, CMRR, and the new Naval Reactors ECF to support the projects' cost, scope, and schedule as part of baseline approval at Critical Decision-2. NNSA is seeking as much certainty as possible in securing a budget profile and spend plan once the projects have been baselined, and will emphasize the importance of maintaining these budgets and spend plans until project completion. In the case of UPF and CMRR, NNSA's current project execution plan aligns with the 10 year budget profiles outlined in the Section 1251 Report of the NDAA for Fiscal Year 2011.

11. Senator NELSON. Mr. D'Agostino and Dr. Anastasio, is there anything specific in the design of the UPF or the CMRR facilities that you are reviewing in light of the events in Japan?

Mr. D'AGOSTINO. Yes. UPF and CMRR are being designed in accordance with modern seismic design standards for nuclear facilities. Nevertheless, NNSA has retained independent seismic experts to study these projects for risks similar to the Japan event.

Dr. ANASTASIO. The CMRR Nuclear Facility design is based on a very significant seismic event determined using geological analysis. The design was based on the most recent seismic hazard analyses (2007 and 2009 revision). This includes very severe scenarios which include a combination of events, such as a large seismic event coupled with laboratory fires, the most severe event postulated for a facility of this type. In line with recent guidance from the Secretary of Energy, LANL is

conducting a thorough evaluation of the seismic hazards coupled with other accident scenarios as factors in the CMRR facility design. As the design for the facility continues to mature the results of accident evaluations will continue to be incorporated as engineering inputs to structural, facility systems and equipment design criteria.

REPLACEMENT OF THE IDAHO EXPENDED CORE FACILITY

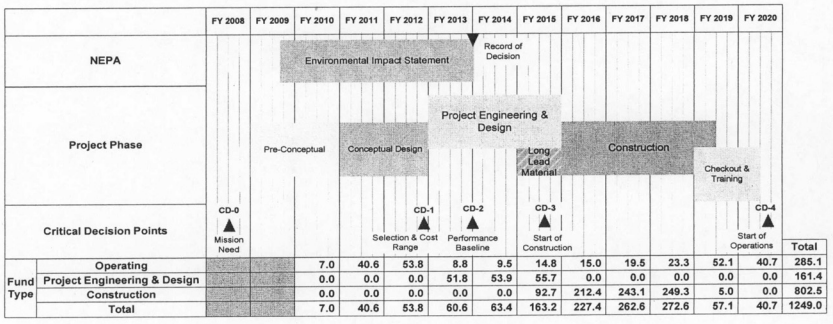
12. Senator NELSON. Mr. D'Agostino and Admiral Donald, last year the Office of Naval Reactors (NR) requested $40.6 million for conceptual design for the replacement building for the new ECF in Idaho. This new facility would be a new spent fuel building to support the NR program. In fiscal year 2012 the request for conceptual design is $53.8 million. The actual construction project would not start until 2013. What is the anticipated total project cost for this new facility?

Mr. D'AGOSTINO and Admiral DONALD. The Total Project Cost for the Spent Fuel Handling Recapitalization Project (SFHP) is estimated to be $1,249 million, and will recapitalize the over 50-year-old ECF as the location for naval spent nuclear fuel receipt, packaging, and secure temporary dry storage. This estimate of the Total Project Cost is based on scoping studies conducted for a range of alternatives that could provide the required capabilities. Actual costs to design and fabricate similar equipment used at the ECF were considered in forming the basis of the approximate $400 million cost estimate for the required equipment. The cost estimate also includes approximately $650 million for the construction of new facilities as well as potential cost saving measures, such as modification of existing facilities for continued use with new facilities. Also included is approximately $200 million of Other Project Costs that include items such as conceptual design, National Environmental Policy Act (NEPA) work, analysis, safety oversight, development of procedures and manuals, training, general facility engineering startup support, and technical support. This Total Project Cost estimate has been reviewed by industry experts with experience in delivering large, complex construction project associated with nuclear material handling.

Included within the scope of the SFHP:

- Evaluation and selection from existing technology and processes for spent nuclear fuel handling.
- Design and delivery of a facility and facility systems in which the spent nuclear fuel handling will be performed.
- Design and delivery of infrastructure specifically needed to support spent nuclear fuel handling operations (power distribution substations, rail service to new facilities, etc.).
- Design and delivery of equipment needed for handling spent nuclear fuel.
- Design and delivery of equipment needed for packaging and disposal of waste generated during spent nuclear fuel handling operations.
- Ability to perform initial cursory external visual examinations.
- Test, operating, and preventive maintenance procedures, and drawings for the spent fuel handling process systems, equipment, facilities, and facility systems.
- Personnel training and development of training programs for the facilities, facility systems, and spent nuclear fuel handling equipment.
- Project management.
- Support services needed for the project.
- Management for subcontracts supporting the design and construction of the facilities, facility systems, and spent nuclear fuel handling equipment needed for this project.
- Reports and submittals, including those submittals required for Critical Decisions.
- NEPA analyses and actions.

Full funding in the early years of the project remains critically necessary to ensure that the facility and equipment are sufficiently defined such that requests for fiscal year 2013 Project Engineering and Design funds and fiscal year 2015 Construction funds are fully justified and support the overall project schedule.



		FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	Total
Fund Type	Operating			7.0	40.6	53.8	8.8	9.5	14.8	15.0	19.5	23.3	52.1	40.7	285.1
	Project Engineering & Design			0.0	0.0	0.0	51.8	53.9	55.7	0.0	0.0	0.0	0.0	0.0	161.4
	Construction			0.0	0.0	0.0	0.0	0.0	92.7	212.4	243.1	249.3	5.0	0.0	802.5
	Total			7.0	40.6	53.8	60.6	63.4	163.2	227.4	262.6	272.6	57.1	40.7	1249.0

A breakdown of the costs for labor and materials and subcontracts is provided below.

Labor		FY											
($M, Then-Year)		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Fund Type	Operating	6.0	28.1	35.1	5.2	4.5	9.8	9.3	9.4	15.1	32.3	28.5	183.3
	Project Engineering and Design	0.0	0.0	0.0	33.7	34.8	34.8	0.0	0.0	0.0	0.0	0.0	103.3
	Construction	0.0	0.0	0.0	0.0	0.0	1.3	21.2	17.6	17.4	0.0	0.0	57.5
Total		6.0	28.1	35.1	38.9	39.3	45.9	30.5	27.0	32.5	32.3	28.5	344.1

Materials and Subcontracts		FY											
($M, Then-Year)		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Fund Type	Operating	1.0	12.5	18.7	3.6	5.0	5.0	5.7	10.2	8.2	19.9	12.2	102.0
	Project Engineering and Design	0.0	0.0	0.0	18.1	19.1	20.9	0.0	0.0	0.0	0.0	0.0	58.1
	Construction	0.0	0.0	0.0	0.0	0.0	91.4	191.2	225.5	231.9	5.0	0.0	745.0
Total		1.0	12.5	18.7	21.7	24.1	117.3	196.9	235.7	240.1	24.9	12.2	905.1

13. Senator NELSON. Mr. D'Agostino and Admiral Donald, would that amount include the demolition of the old facility?

Mr. D'AGOSTINO and Admiral DONALD. The project cost of the SFHP does not include the demolition of the current ECF. The current ECF mission includes the unloading, examination, processing and temporary dry storage of spent nuclear fuel, in addition to the examination of irradiated material from the Idaho National Laboratory Advanced Test Reactor. All of these aforementioned operations must continue while the SFHP is constructed and placed into operation. For example, ship refuelings will continue to require that spent nuclear fuel is unloaded from the limited number of spent fuel shipping containers available, and critical core examinations necessary to validate fuel performance must continue. Consequently, an inventory of spent nuclear fuel and irradiated materials will exist in ECF at the time SFHP becomes operational. It is impractical and cost-prohibitive to move the spent nuclear fuel present in ECF to SFHP to complete processing operations for dry storage in the new facility. In addition, there are a number of important core examinations underway later this decade that must not be interrupted in support technical decisions for the operating fleet. Due to these factors, final disposition of ECF will be deferred until after the completion of the currently identified ECF mission.

14. Senator NELSON. Mr. D'Agostino and Admiral Donald, can NNSA afford another expensive building?

Mr. D'AGOSTINO and Admiral DONALD. The SFHP will recapitalize the over 50-year-old ECF as the location for naval spent nuclear fuel receipt, packaging, and secure temporary dry storage. Naval Reactors' ability to continue work in Idaho is dependent upon a viable, efficient fuel-handling infrastructure. Although the ECF

continues to be maintained and operated in a safe and environmentally responsible manner, further deterioration of the infrastructure could profoundly impact the Naval Reactors mission. Uninterrupted receipt of naval spent nuclear fuel is vital to the timely, constant throughput of ship refuelings and return of these warships to full operational status. If an interruption in ECF operations were to extend over long periods, the ability to sustain fleet operations would be negatively impacted since there would be no capacity available to receive naval spent fuel, thereby tying up shipping containers and halting defueling operations. Completion of the recapitalization of the spent nuclear fuel infrastructure is needed by 2020 to support the Navy's tight refueling and defueling schedule for nuclear-powered aircraft carriers. A delay to delivery of this new facility will result in costly and time-consuming workarounds (e.g. procurement of additional spent fuel shipping containers and associated equipment) or delays to the defuelings of nuclear powered warships.

In this constrained funding environment, Naval Reactors recognizes the need for prudent project management to constrain costs. Naval Reactors will leverage its extensive project management experience to do exactly that. The Program routinely manages significant projects, such as the design and construction of the *Virginia*-class submarine and the *Ford*-class aircraft carrier reactor plants. Naval Reactors also routinely manage large ship projects, including nuclear powered aircraft carrier and submarine refueling overhauls. These efforts include the planning and scheduling of the refueling; design and development of specialized equipment; planning and technical approval of shipyard facilities and equipment; transportation and handling of spent fuel, and reviewing and approving detailed procedures for conduct of refueling operations. Additionally, Naval Reactors has managed the development, operation, and maintenance of over 25 classes of nuclear powered submarines and three classes of nuclear powered aircraft carriers; as well as the design, construction, operation, and maintenance of eight land-based prototypes. The Naval Reactors professionals that are assigned to the SFHP have many years of Naval Reactors project management and oversight experience.

In addition, the SFHP is being managed consistent with DOE Order 413.3B (Program and Project Management for the Acquisition of Capital Assets) as implemented by Naval Reactors. The Program is also capitalizing on established requirements and lessons learned from management of our Navy projects, including the use of formalized nuclear safety, refueling equipment, and refueling system design processes. These combined processes, along with the rigorous budgeting and accountability processes routinely employed by Naval Reactors, ensures capability of executing a project of this size.

Finally, Naval Reactors has contracted with an experienced Engineering, Procurement, and Construction Management contractor and is leveraging relevant experience through our prime contractor, Bechtel National Inc.

15. Senator NELSON. Mr. D'Agostino and Admiral Donald, will the ECF have a design that is 90 percent complete by CD–2?

Mr. D'AGOSTINO and Admiral DONALD. The SFHP is being managed consistent with DOE Order 413.3B (Program and Project Management for Acquisition of Capital Assets). Consistent with that order, the preliminary design will be 100 percent complete by CD–2. The preliminary design provides the detail needed to provide a reasonable assurance that the design will be implementable within the approved performance baseline. Consistent with DOE Order 413.3B, the fully completed preliminary design will form the basis of the Performance Baseline which is approved at CD–2.

16. Senator NELSON. Mr. D'Agostino and Admiral Donald, will the project baseline for the ECF for the purposes of section 3114 be established by CD–2?

Mr. D'AGOSTINO and Admiral DONALD. Yes. Naval Reactors approval of the SFHP CD–2, Performance Baseline, will establish the SFHP project cost and schedule baseline, consistent with the requirements of DOE Order 413.3B, Program and Project Management for the Acquisition of Capital Assets. CD–2 approval requires that the design be sufficiently mature to provide a reasonable assurance that the design will be achievable within the approved performance baseline. The SFHP Performance Baseline will include the key project performance, scope, cost, and schedule parameters, and will be provided to the congressional defense committee in accordance with section 3114 of NDAA for Fiscal Year 2011.

17. Senator NELSON. Mr. D'Agostino and Admiral Donald, will an ICE be performed for the ECF?

Mr. D'AGOSTINO and Admiral DONALD. Yes, Naval Reactors will perform ICEs prior to CD–1 and prior to CD–2, consistent with DOE Order 413.3B, Program and

Project Management for the Acquisition of Capital Assets. The ICEs will help validate that the program estimates are well-documented, comprehensive, accurate, and credible by ensuring that the included costs are reasonable and that no costs were omitted, that they reflect a realistic schedule with technically-reasonable assumptions, and that risks and uncertainties are appropriately accounted for and quantified.

18. Senator NELSON. Mr. D'Agostino and Admiral Donald, will all new technologies be TRL–7 at construction start, as well as CD–3?

Mr. D'AGOSTINO and Admiral DONALD. The SFHP will not pursue new technologies since the fundamental technology to unload, examine, process, and package naval spent nuclear fuel currently exists. While Naval Reactors does not use technology readiness levels to manage its technical efforts, the Program judges that the technologies included in the SFHP to be equivalent to a level 8 (total system completed, tested, and fully demonstrated). This assessment is based on the fact that the design of the spent fuel handling and processing equipment for the SFHP uses technology that has been demonstrated in existing equipment that is currently operating in a production environment at the ECF. The SFHP is being designed to improve the production capacity of the existing ECF infrastructure and will integrate lessons learned from over 50 years of operating within the current ECF.

DELAYS IN NAVAL REACTORS M–290 IDAHO FACILITY CONSTRUCTION

19. Senator NELSON. Admiral Donald, the construction project at the NR Idaho facility to receive and handle M–290 spent fuel shipping containers is about a year late, both in the start of construction and in the start of operations. The most recent schedule indicated that the approval to start construction, CD–3, would be in the second quarter of fiscal year 2011. What was the reason for the delay and has the delay resulted in increased costs?

Admiral DONALD. As part of the fiscal year 2010 budget request, Naval Reactors requested money for the ECF M–290 Receiving/Discharge Station. At that time, the project was scoped only to modify (e.g., installation of larger capacity crane) the current ECF to allow the receipt and handling of M–290 shipping containers. Although the performance baseline for the project was not yet established, Naval Reactors included in the budget request documentation outlining a schedule, in which construction was scheduled to begin (CD–3) in the first quarter of fiscal year 2010. The fiscal year 2010 budget request also identified the need for a separate Naval Reactors Facility (NRF) Storage Overpack Complex in fiscal year 2011.

After the fiscal year 2010 budget request was submitted, Naval Reactors recognized it could not meet its spent fuel handling requirements under this arrangement. Specifically, the Program would not be able to concurrently conduct two significant program missions in ECF:

(1) Return of spent naval fuel from the Idaho Nuclear Technology and Engineering Center (INTEC)
(2) Aircraft carrier refueling/defuelings using the M–290.

If left unchanged, this would have had a direct negative impact to both the State of Idaho settlement agreement and operational needs of the nuclear aircraft carrier fleet.

Accordingly, Naval Reactors modified the construction plan to ensure the Program could continue to meet its spent fuel handling requirements. Rather than modify the existing ECF as originally planned, Naval Reactors determined the mission required a new facility for the receipt and handling of M–290 shipping containers. That facility, the ECF M–290 Receiving/Discharge Station project, would also incorporate the NRF Storage Overpack Complex project identified above. This single Major Construction Project (MCP) will eliminate workflow conflicts and will provide the capability for concurrent receipt of fuel from INTEC and receipt and handling of M–290 shipping containers.

The current or revised scope of the project and schedule was outlined in the fiscal year 2011 budget request to Congress. That schedule indicated that CD–2 would be completed in the first quarter of fiscal year 2010. CD–2, including the new performance baseline for the project, was approved on 30 November 2009. This approved performance baseline states that CD–3 will occur in the second quarter of fiscal year 2011. CD–3 for the project was approved by Naval Reactors on 25 April 2011. In addition, the project is within the cost estimate included in the performance baseline.

20. Senator NELSON. Admiral Donald, has construction approval been received? If not, why not?

Admiral DONALD. Yes, construction approval (CD–3 (Start of Construction)) for the M–290 Receiving/Discharge Station (CSRF/OSE2) rail siding was provided in the first quarter fiscal year 2011. The CD–3 for the CSRF/OSE2 facility has been approved by Naval Reactors on 25 April 2011.

21. Senator NELSON. Admiral Donald, what is the status of the design, is it 90 percent complete as is the NNSA requirement?

Admiral DONALD. The 100 percent final design for the ECF M–290 Receiving/Discharge Station (CSRF/OSE2) has been submitted by the contractor. Construction began on the project in fiscal year 2011 with approval of the CD–3 for the CSRF/OSE2 rail siding. The CD–3 for the CSRF/OSE2 facility was approved by Naval Reactors on 25 April 2011.

22. Senator NELSON. Admiral Donald, is this considered a new start and thus construction cannot begin under the CR?

Admiral DONALD. The ECF M–290 Receiving/Discharge Station is not considered a new start and construction may begin under a Continuing Resolution. Identified as a MCP since fiscal year 2008, this project received $545,000 in fiscal year 2008, $300,000 in fiscal year 2009, and $3,236,000 in fiscal year 2010 in project engineering and design (PED) funding. The project received an additional $6,264,000 in fiscal year 2010 to support long-lead procurement of a 310 ton crane with a 75 ton auxiliary hook.

The PED funds provided Architect-Engineering services for the ECF M–290 Receiving/Discharge Station construction project, allowing the project to proceed from conceptual design into preliminary design and final design. The design effort assured project feasibility, defined the scope, provided detailed estimates of construction costs based on the approved design and working drawings and specifications, and provided construction schedules, including procurements.

PROTECTIVE FORCES

23. Senator NELSON. Mr. D'Agostino, last March, the Strategic Forces Subcommittee held a hearing on the protective forces that guard the nuclear weapons and materials at DOE sites. The majority of these sites are NNSA sites. It was clear from that hearing that NNSA and DOE needed to look at the career path options for these highly trained forces, particularly with respect to retirement eligibility. The rigorous physical requirements of these forces merit the possibility of a 20-year retirement program along the lines of some law enforcement, military, and NNSA courier retirement programs. Shortly after that hearing, DOE was supposed to provide an implementation plan to address the retirement and other issues. This report was not submitted until January of this year and it did not include a plan, just a recitation of the issues and a promise to study the options again. This issue has been unresolved for over 3 years. The current contracts for the Guard forces expire in just over a year and it is possible that the forces will strike if these issues are not resolved. One site did have a strike over these issues when the last contract expired. The DOE representative at the March hearing testified that the issue needed to be resolved promptly. But here we are 1 year later and with the issue still unresolved. It is important to ensure that the nuclear materials and weapons continue to be protected. When is NNSA planning to resolve this retirement issue for the protective forces?

Mr. D'AGOSTINO. NNSA and the Department as a whole continue to evaluate all measures that seek to enhance career longevity for contractor protective force employees. In furtherance of its goal to study retirement benefit options for protective force employees, NNSA commissioned a study to evaluate costs associated with a variety of different benefit options for contractor protective force employees. The study evaluated three benchmark retirement plans as the first step toward understanding the costs and comparative benefits associated with each type of plan. The three benchmark design alternatives were: (1) the Hanford Multi-Employer (Defined Benefit) plan applicable to the Guards union; (2) a Defined Contribution plan similar to the one offered to certain contractor employees at Lawrence Livermore National Laboratory; and (3) the Nuclear Materials Couriers Plan, which includes elements of both Defined Benefit and Defined Contribution plans. A fourth "Notional Alternative Plan," which mirrors the Couriers' plan but excludes some of the more costly features, was also included in the analysis.

To be clear, the protective force members are employees of the contractors, not NNSA. The contractor protective force employees at all but one of the NNSA sites are represented by labor unions. Accordingly, any changes to existing benefits plans would have to be agreed to during the collective bargaining process between the contractor and the union representing the protective force employees. Therefore, the study that was performed provides objective cost estimates for the liabilities that the government would be responsible for reimbursing pursuant to its contracts with NNSA contractors if the protective force employees were to participate in benefit plans that resemble the benchmark plans.

The study has been completed, and NNSA senior management is conducting a thorough review of the report. The Department owes its stakeholders, the taxpayers, and all potentially affected employees deliberate and careful consideration of these options.

24. Senator NELSON. Mr. D'Agostino, my understanding is that there is a way to address this by establishing an accelerated 401K system. Would you look into this and report to us, before the time we mark up the National Defense Authorization Bill for Fiscal Year 2012, as to how we might fix this issue?

Mr. D'AGOSTINO. As part of the Department's protective force career options initiative, DOE and NNSA have encouraged protective force contractors and unions to offer ideas and concepts as to how career longevity and retirement options might be addressed, and we continue to receive input from these sources. One NNSA contractor and the protective force union at that site have discussed an "accelerated 401(k) system" and this option will be included in the broader Departmental discussion of this issue as details of this notional plan emerge. All legal and feasible options that are brought to the Department's attention will be considered by DOE management. If the full accelerated 401(k) proposal is presented to the NNSA before the markup the fiscal year 2012 defense authorization bill, we will report to you on this recommendation.

AVIATION

25. Senator NELSON. Mr. D'Agostino and Dr. Cook, in December, NNSA made a significant change in the way it manages the aviation program of the Office of Secure Transportation. As part of this change, the DOE Office of Aviation will have increased oversight responsibilities for the NNSA program in lieu of the Federal Aviation Administration (FAA). Is there a plan in place for the DOE Office of Aviation to oversee the NNSA program?

Mr. D'AGOSTINO and Dr. COOK. There will be no change to the manner in which the DOE Office of Aviation Management will conduct its responsibilities. Currently, OST is studying a move to Federalize pilots. Based on the outcome of this study, the FAA will conduct the appropriate surveillance of OST's aviation program pursuant to FAA regulations.

26. Senator NELSON. Mr. D'Agostino and Dr. Cook, the FAA had previously determined that the NNSA served in both a civil and public function and thus had to comply with part 119. Has FAA approved the NNSA plan to move away from FAA regulations under part 119?

Mr. D'AGOSTINO and Dr. COOK. NNSA's Office of Secure Transportation continues to operate both public and civil flights and will comply with applicable sections of Part 119 and all other applicable FAA regulations. As such we will operate under Part 125 as approved by the FAA. Public flights are conducted to support the agency's governmental function such as moving Limited Lifetime Components. All other flights are considered civil unless approved otherwise by the FAA administrator. An example of a civil flight would be to move passengers to training. All civil flights must be cost justified and compared to commercial air transport before utilizing government aircraft for civil flights. Historically over the last 3 years, approximately 90+ percent of our flights are public.

27. Senator NELSON. Mr. D'Agostino and Dr. Cook, I would note that the explanatory statement accompanying the NDAA for Fiscal Year 2011 said with respect to the operation of the Secure Transportation Asset (STA) aircraft:

The Secretary of Energy and the Administrator of the NNSA are directed to consult with the FAA to determine whether the operations of the STA aircraft are public or civil operations, or a combination, and the appropriate equivalency standard under which the STA aircraft should be operated, maintained, and managed. In addition, the Secretary and the Administrator are directed to submit a report to the

congressional defense committees that sets forth the FAA determination, the ability of the NNSA to meet the requirements of the DOE orders if NNSA will operate as a self-regulated entity, and whether the DOE Office of Aviation is capable of conducting FAA like oversight and inspections. This report should be completed before 737 operations begin.

When do you expect 737 operations to begin?

Mr. D'AGOSTINO and Dr. COOK. NNSA's Office of Secure Transportation's (OST) Aviation Program will comply with the applicable portions of FAA regulations found at 14 C.F.R. (Aeronautics and Space) and 41 C.F.R. 102–33 (Management of Government Aircraft). Flight Operation of the aircraft is expected to begin in August 2011. Mission support availability expected to begin on 1 December 2011.

28. Senator NELSON. Mr. D'Agostino and Dr. Cook, when will the report be submitted to Congress?

Mr. D'AGOSTINO and Dr. COOK. NNSA will comply with the requirements as set forth by the FAA. The FAA accepted a letter of application from NNSA that outlines our proposed operating construct to operate under Part 125 of 14 CFR. NNSA sees no operational, management or legal constraints that would result in a denial of authorization. At this point the only limiting factor before final consideration by the FAA is the hiring of pilots. NNSA owns one aircraft and is currently finalizing the acquisition of the second. At that point NNSA will have adequate information and direction from the FAA and can submit a report shortly thereafter.

COMPUTATIONAL AND EXPERIMENTAL CAPABILITIES

29. Senator NELSON. Dr. Anastasio, Dr. Miller, and Dr. Hommert, all of the experimental tools that were identified when the Stockpile Stewardship Program (SSP) was established are now operational. Have you considered what experimental tools might be needed in the future?

Dr. ANASTASIO. The experimental tools, DARHT, and Los Alamos Neutron Science Center at Los Alamos, and NIF at Lawrence Livermore that were first identified when the SSP began some 15 years ago are just beginning to provide remarkable data that scientist and engineers are using to better understand and evaluate the safety, security, and effectiveness of the Nation's nuclear deterrent. Contrary to what some have suggested, we are definitely not "done" with science. There are many significant areas of work that remains to be done. There are critical open questions that remain to be solved to retain our confidence in the stockpile and we cannot fully predict the scientific challenges that are still ahead as it continues to age and goes through modernization.

As we seek to sustain the deterrent and improve our understanding of the Nation's aging stockpile through the SSP, LANL believes that future mission needs require investment in new and more capable experimental facilities and computational capabilities. As an example, we are examining materials in extreme environments, exploiting in situ, transient measurements to study materials in relevant dynamic and irradiation extremes. Constructing such a facility would revolutionize material performance in extremes by conquering "the micron frontier"—the domain in which materials microstructure and defects dominate performance AND our predictive capability for the stockpile is the weakest—and advancing the transition from observation and validation of materials performance to prediction and control of materials functionality.

LANL has engaged the weapons science community including our colleagues at LLNL and Sandia as well as in the UK, and the broader scientific community to define such a facility and is currently performing a pre-conceptual design study for a facility that we call MaRIE, for Matter-Radiation Interactions in Extremes, including the identification of scientific and systems requirements, analysis of alternatives that would meet those requirements, and trade studies that would assess the cost-risk-benefits of a variety of technical options. LANL believes that a facility such as MaRIE would provide needed dynamic observations of microstructure to the SSP, validating theoretical descriptions and ultimately yielding control of materials needed to reduce cost and increase confidence in the stockpile. MaRIE provides not only multiple, simultaneous in situ measurements of multi-granular materials with subgranular resolution, but also synthesis capabilities to predictively design high performing materials for these environments as well as multiple probes of materials mixing in extremes, a known consequence of materials damage and failure.

Dr. MILLER. From an experimental point of view, the most important thing right now is to provide the funding to adequately utilize the tools we have established, such as the Dual Axis Radiographic Hydrodynamic Test Facility (DARHT), the NIF,

and the Joint Actinide Shock Physics Experimental Research (JASPER) facility; requirements for additional experimental facilities have not emerged from our research. An area in which additional capability is need is HPC and simulation.

There remain key areas, such as boost physics, where we still lack adequate knowledge. Predictive Capability Framework campaigns utilize our advanced stockpile stewardship tools to fill gaps in knowledge about nuclear weapon performance relevant to existing or expected issues about stockpiled weapons. These activities integrate the use of state-of-the-art high-performance computers, high-fidelity simulation models validated by data gathered from state-of-the-art experimental facilities. This cutting-edge research provides both the basis for stockpile stewardship and the tools by which the Laboratory experts make judgments about the health, safety, security, and effectiveness of the stockpile.

In addition to the experimental facilities we rely on, we need to continue to advance our HPC capabilities to provide the weapons program with computing platforms for modeling and simulation (M&S) at the exascale level. To assure that NNSA's future mission critical needs are met, a decadal, sustained R&D investment is necessary to advance supercomputing to exascale-class platforms (1×10^{18} or 1,000,000,000,000,000,000 floating point operations per second)-supercomputers on the order of 1,000 times more powerful than the fastest in existence. Current petascale supercomputing has manifestly improved M&S capabilities, but users remain limited by speed or length of run time in performing calculations, or inability to perform adequate uncertainty analyses of complex systems. A central R&D challenge is power consumption. If the current HPC technology were used and the number of processors simply scaled up, an exascale machine would take hundreds of Megawatts of power costing tens of millions of dollars annually to operate—making the machine more expensive to operate than procure. Therefore, significant technological innovations are needed to improve efficiency—gains approaching the order of 100—will be necessary to reach an optimal next-generation exascale platform.

The NIF is a critical experimental facility required to meet the Nation's stockpile stockpile stewardship goals and validate our computational models. It is very important that the NIF be funded at a level consistent with the current implementation plan to meet required deliverables and maximally benefit from the investments made in the facility and its operation. The SSP relies on NIF for ignition and non-ignition experiments.

NIF has been operational since the facility's dedication in May 2009. NIF with its 192 laser beams has performed exceptionally well. It is proving to be a remarkably reliable and precise system.

NIF is the focal point for the National Ignition Campaign (NIC). The purpose of NIC is to determine the feasibility of fusion ignition and transition NIF from a construction project to routine experimental operations for weapons and basic science by the end of fiscal year 2012. With respect to fusion, NIC has two major goals: execution of DT ignition experiments starting in fiscal year 2010 for the purpose of demonstrating ignition and development of a reliable, repeatable ignition platform for weapons physics, basic science, and energy research by the conclusion of NIC at the end of fiscal year 2012.

There have been a number of important successes at NIF. In the hohlraum energetics campaign, the NIC team demonstrated that the interaction between the laser beams and the target could be satisfactorily controlled and the conditions necessary to implode the hydrogen fuel could be achieved.

We have also demonstrated the integration of all of the subsystems needed for the ignition. Cryogenically cooled ignition targets with a layer of solid tritium, hydrogen, and deuterium (THD) have been successfully created and imploded. One shot in particular achieved a record-setting 1.3×10^{14} neutrons.

NIC continues to make excellent progress and the results of implosion experiments are very encouraging. We continue to learn much from the experiments and see no "show stoppers." We are optimistic about success in achieving fusion ignition but mindful that NIC is an extremely challenging undertaking that is at the frontiers of science and technology. Current plans are to complete the current fusion ignition and burn campaign in spring or summer of 2012.

NIF also executes "non-ignition" experiments in support of the SSP. In late February-March 2011, we conducted the most recent highly successful campaigns of high-energy-density physics experiments in support of stockpile stewardship on NIF. One campaign focused on radiation transport to gather data to validate the capability of our physics simulation codes to model phenomena. Altogether, 16 experiments were performed in 11 shot days. These included the first experiments performed that included diagnostics to provide time-resolved radiographic data. Preliminary comparisons of data taken are in agreement with pre-shot predictions. A second campaign focused on developing and using a technique for gathering equa-

tion-of-state data to characterize the properties of highly compressed (but unheated) materials-in this case, tantalum and carbon. Gathered data from such experiments are needed for scientific advances that underpin both stockpile stewardship and planetary science.

Dr. HOMMERT. The challenging work necessary over the next two decades to extend the lifetimes of key weapon systems in the US nuclear arsenal will require application of the new experimental facilities and tools created during the Science-Based Stockpile Stewardship era, and will also require upgrades and recapitalization for a number of legacy capabilities. Several key investments are required in order for Sandia to successfully execute our warhead systems engineering and integration responsibilities and our design and qualification activities for non nuclear components and subsystems. Some of our major environmental test facilities were first commissioned in the 1950s, and they must be upgraded to modern standards to support the design and development testing for the B61 Life Extension Program (LEP). Facility and equipment enhancements are needed at the Tonopah Test Range where we will perform critical development flight testing of the B61 LEP. Sandia will provide critical radiation hardened microelectronics for upcoming LEPs and ALTs. Our capabilities are officially accredited with "trusted" status for both the design and manufacture of microelectronics, which is critical in an age of growing cyber threat concerns about microelectronic supply chain surety. Our silicon fab facility requires recapitalization because the tooling is 10–15 years old, and this is an industry where the technology turns over every couple of years. Of 137 tools in the silicon fab, more than 25 percent have only 3rd party support, and another 25 percent have no OEM support or spare parts. The recapitalization must begin soon to address the ever-increasing risk of running existing equipment to failure.

The unique pulsed power capabilities associated with Sandia's Z facility are advancing our understanding of the performance of nonnuclear components in extreme radiation environments, and providing valuable Equation of State experimental data for the physics labs in the critical area of dynamic material response. We also apply this expertise in High Energy Density Physics more broadly to the diagnostics and experimental design needs of the National Ignition Campaign and the Predictive Capabilities Framework.

30. Senator NELSON. Dr. Anastasio, Dr. Miller, and Dr. Hommert, underpinning all of the experiments and past nuclear tests are the world's leading computational and modeling capabilities, which have been developed by NNSA. The ability to model the performance of nuclear weapons using the new experimental data and past data from the days of nuclear testing is essential to maintaining the nuclear weapons stockpile, safely, securely, and reliably into the future. How important is this computation capability to your work?

Dr. ANASTASIO. The computational capability to model and understand the performance of nuclear weapons is essential to our work, and it always has been. One of the largest successes of the Stockpile Stewardship has been our remarkable advances in supercomputing capability, and specifically our ability to model the complex phenomena that occur in a weapon. What we have discovered is that with each improvement in simulation performance. We see greater fidelity and develop an improved understanding as well as further awareness of what we still do not understand. Thus moving to the next generation of computing (exascale) is not a luxury or simply speed for the sake of speed. It is essential to our understanding of the challenges we face with the stockpile, in particular as we move further away from our underground test experience.

Dr. MILLER. HPC serves as the integrating element of the SSP and has been instrumental in the success of the SSP to date. The significant resources the country has expended over the past few decades in HPC have proven to be a very worthwhile investment. Nuclear weapons are highly engineered 3–D systems with complex materials that change over time. HPC simulations of stockpile performance, security, and safety help identify problems in the stockpile, assess the impact, and devise solutions. Without HPC, the SSP would not have been successful in sustaining confidence in the safety, security, and effectiveness of the U.S. nuclear stockpile in the absence of nuclear testing. However, there are still unresolved issues that require continued growth in our HPC capabilities to exascale computing in order to stay on top of stockpile concerns and meet future challenges. Achieving exascale computing is a technically challenging endeavor, similar in magnitude to the effort expended in the 1990s to develop terascale computing. This greatly increased capability will have other positive impacts on our country's national security and competitiveness. I am pleased that a program to initiate this effort is included in the President's Budget Request and strongly urge support for an aggressive research

and development effort to create the technologies necessary to achieve and apply exascale computing.

Dr. HOMMERT. Computational capabilities, which encompass both engineering simulation codes and high performance computational platforms, are essential tools in meeting our stockpile modernization and stewardship commitments over the coming decades. As our Nation moves towards a smaller stockpile, confidence in the safety, security, and effectiveness of the arsenal must be characterized more rigorously through quantification of margins and uncertainties (QMU) of these engineered systems. Computational simulation allows us to create age-aware performance models and thereby predict the future impacts of fundamental materials aging mechanisms on stockpile performance. This predictive understanding provides lead time for decisions on required stockpile actions. HPC capabilities are also important to our coverage of environmental requirements for the stockpile. While it is not possible to perform physical tests in all of the environments and credible scenarios that a weapon could potential encounter during its lifecycle, computational simulation can simulate these environments and inform our technical understanding. Computational simulation plays a significant role in many lifetime extension program activities including: environments definition, engineering design and integration, and systems qualification. It is critical that our computational tools and platforms provide the confidence and credibility required to inform high-consequence stockpile decisions.

31. Senator NELSON. Dr. Anastasio, Dr. Miller, and Dr. Hommert, is the development of the capability keeping pace with stockpile requirements?

Dr. ANASTASIO. Since the advent of the SSP, the increase in our computational capabilities has been impressive. What we have discovered is that with each improvement in simulation performance we see greater fidelity and develop an improved understanding as well as further awareness of what we still do not understand.

With this increased capability, Los Alamos and the other national nuclear laboratories have been able to deal with stockpile maintenance for the past 18 years and have been able to introduce additional margin into the nuclear weapons systems where possible. The national laboratories have also been able to more accurately quantify the uncertainties associated with nuclear weapons as they age. However, after a decade and half of stockpile maintenance we have exhausted many of the maintenance options certifiable with our current computational capability.

Throughout this process, we have been able to identify computational infrastructure and code improvements advancements needed to accurately understand the physics and chemical changes occurring in the stockpile as it ages or to further understand options available for future LEPS. From these examinations, it is clear that higher levels of computational power are required to assess and certify the current and future stockpile. This will require greater investments (platforms and codes) than is projected in the FYNSP. An enhanced computational capability that allows us to advance the scientific understanding of our maintenance options in the absence of nuclear testing is required. This will increase the number of options available to us as we maintain the stockpile, ensuring that we keep pace with stockpile requirements.

Dr. MILLER. In terms of experimental tools, additional tools are not required at this time. However, providing adequate funding to fully utilize the existing tools such as the DARHT, the NIF, and the JASPER facility is essential. In the HPC and simulation area, the additional capability of exascale computing and simulation platforms is necessary.

The SSP has been extraordinarily successful in maintaining the nuclear deterrent without needing to resort to underground testing. Through our success in coupling advanced HPC simulation capabilities with data gathered from nuclear weapons science experimental facilities like LLNL's Contained Firing Facility and LANL's DARHT facility and high energy density physics data from NIF, we have largely resolved the energy balance anomaly. We now have a key piece of the puzzle to attack the many resulting science challenges and LEP design issues. We are also moving forward to complete the second keystone of SSP, developing a fundamental understanding and predictive capability for boost.

Nuclear weapons are highly engineered 3–D systems with complex materials that change over time. The accumulation of small changes that are inherent in component aging, material compatibility issues, and refurbishment of aging components, take our warheads away from their original designs whose safety and reliability were certified in the era when nuclear tests were still being conducted. Recently identified warhead issues (that were not identified when certain warheads were first introduced into the stockpile) further complicate assessments. These factors increase

uncertainty in the performance of existing warheads, but have not undermined weapon certification. Experience has shown that at least one major new and unanticipated issue is discovered about every 5 years.

SSP is focused upon an extraordinary challenge: predicting how a nuclear weapon changes in time with quantified uncertainties. We do not currently have the computing power needed to simulate weapons performance in 3–D at the required resolution while incorporating the needed detailed physics and age-aware material models. Additionally, we do not have the computing power to conduct the tens of thousands of high-resolution 3–D simulations needed to quantify the uncertainty in our predictions. Today's available technology forces us to choose between simulating weapon performance in 2–D with high resolution and physics fidelity or simulating in 3–D. While 2–D simulations were sufficient to establish the physical principles behind aging effects, applying that understanding to the stockpile requires high-fidelity 3–D simulations. Therefore, a new architecture enabling exascale computing is needed.

Dr. HOMMERT. The challenge we face going forward is the application of the powerful computational stockpile stewardship tools to the now urgent life extension needs of the stockpile. Our design and development work for multiple LEPs over the coming decades will rely extensively on our engineering simulation capabilities. We must sustain the investment in computational tools to ensure that capacity keeps pace with the LEP design workload as we integrate these new tools into the design process. The scope and complexity of Sandia's responsibilities for warhead systems engineering and integration, and non nuclear component design, requires state of the art computational capabilities. The competency base in computational science that underpins these capabilities is strengthened by the NW program research in this area, and effectively applied to broad national security needs associated with cyber threats. The extensive and growing national security challenges in this area will drive the need for continued investments to transition codes and computational platforms to exascale architectures expected over the next decade.

QUESTION SUBMITTED BY SENATOR JEANNE SHAHEEN

NUCLEAR TESTING

32. Senator SHAHEEN. Mr. D'Agostino, is there any technical reason for the United States to resume nuclear explosive testing in the foreseeable future? Why or why not?

Mr. D'AGOSTINO. Currently, there are no known technical reasons for the United States to resume nuclear explosive testing in the foreseeable future. As a result of our successful Stockpile Stewardship and Management Program, NNSA has been able to maintain and enhance the safety, security, and effectiveness of the U.S. nuclear weapons stockpile without resuming nuclear explosive testing. We are now in the 20th year of the underground testing moratorium, and the need for science-based stockpile stewardship is greater than ever. Our weapons systems are beyond their original design lifetimes, and while we have been able to certify them as safe, secure and effective, the stockpile contains some components that are based on technologies up to 60 years old and those components must be replaced and re-certified. Our ability to continue to certify the stockpile over the longer term requires a sophisticated physics-based understanding of the weapons, science-based tools that provide new means, other than underground tests, to solve complex problems, and predictive capabilities to reduce uncertainties. Furthermore, each of those pieces requires advanced computing capabilities to support them. We have made significant advancements in these areas in the past two decades; however, challenging goals remain such as achieving ignition at the NIF and providing a physics-based predictive capability for the stockpile. The success of the Stockpile Stewardship and Management Plan—in particular the infrastructure and human capital investment components—will allow NNSA to continue to maintain and enhance the safety, security, and effectiveness of the U.S. nuclear weapons stockpile without resuming nuclear explosive testing.

QUESTIONS SUBMITTED BY SENATOR JEFF SESSIONS

CHEMISTRY AND METALLURGY RESEARCH REPLACEMENT FACILITY AND URANIUM PROCESSING FACILITY

33. Senator SESSIONS. Mr. D'Agostino, Dr. Cook, Dr. Anastasio, Dr. Miller, and Dr. Hommert, as I mentioned in my opening remarks, the construction projects at

Y–12 in Tennessee and LANL in New Mexico are the foundation of the complex-wide modernization plan and are the key enabler to the many future LEP efforts. Together, cost estimates for these facilities range between $7.9 and $12.3 billion. What is driving the cost?

Mr. D'AGOSTINO. UPF and CMRR are modern and highly sophisticated nuclear facilities where unique and highly complicated operations will be conducted on sensitive materials. Safety and security standards for modern nuclear facilities require robust infrastructure, one-of-a-kind equipment and rigorous validation that all components meet specifications and operate appropriately under established adverse conditions. These factors have driven costs above traditional construction projects.

Dr. COOK. I agree with Mr. D'Agostino and add that, at 50 percent design, these projects are still in preliminary maturity. As their designs have matured these projects have acquired better definition of how the requirements for seismic ground motion, nuclear quality assurance, and security affect the design. We will not set the performance baseline for cost and schedule until the engineering design has reached 90 percent completion. Their scheduled completion is more than 10 years from now, and cost estimate ranges include appropriate contingency to address known uncertainties.

Dr. ANASTASIO. The CMRR facility will support many programs involving plutonium and other actinides. Those programs include direct support for the stockpile, nonproliferation and counter-proliferation programs, counter-terrorism programs, energy programs, and plutonium science. To meet the mission requirements, these facilities must be designed to safely and securely handle and control nuclear material not only for the personnel working in the facility and for the public, even in major postulated and coupled accidents, such as earthquakes. The CMRR facility is being designed for personnel to safely handle all forms of plutonium, including bare metal. We expect these facilities to serve a broad array of national security programs over many decades. In addition, we must protect significant quantities of nuclear materials. These requirements have driven us to a design with multiple, redundant safety systems and security features.

Dr. MILLER. I would respectfully defer to my colleagues at the NNSA for specific information on the cost estimates for the UPF at Y–12 and the Chemistry and Metallurgy Research Replacement (CMRR) facility at LANL. However, I would observe that the type of work performed by NNSA often requires very complex, one-of-a-kind facilities. The nature of these one-of-a-kind facilities makes out-year budgeting quite challenging. For these types of facilities, it is very important to provide flexibility and appropriate contingencies that reflects the various elements of uncertainty within each project.

Dr. HOMMERT. I defer to Mr. D'Agostino, Dr. Anastasio, and the institutions accountable for executing these MCPs.

34. Senator SESSIONS. Mr. D'Agostino, Dr. Cook, Dr. Anastasio, Dr. Miller, and Dr. Hommert, why do these facilities cost so much?

Mr. D'AGOSTINO. UPF and CMRR are modern and highly sophisticated nuclear facilities where unique and highly complicated operations will be conducted on sensitive materials. Safety and security standards for modern nuclear facilities require robust infrastructure, one-of-a-kind equipment, and rigorous validation that all components meet specifications and operate appropriately under established adverse conditions. These factors have driven costs above traditional construction projects.

Moreover, the nuclear facility construction industry has been inactive for many years and there are no comparative construction costs that indicate the UPF and CMRR costs are above market price. NNSA acknowledges that the UPF and CMRR facilities are costly because they are unique and modern nuclear facilities that are being designed to modern nuclear, safety and security standards. As their designs have matured these projects have acquired better definition of how the requirements for seismic ground motion, nuclear quality assurance, and security affect the design. We will not set the performance baseline for cost and schedule until the engineering design has reached 90 percent completion. Their scheduled completion is more than 10 years from now, and cost estimate ranges include appropriate contingency to address known uncertainties.

Dr. COOK. I agree with Mr. D'Agostino.

Dr. ANASTASIO. The CMRR facility (and likewise, the UPF) must be able to perform the assigned mission programs for multiple decades in a safe and secure manner. To meet the mission requirements, these facilities must be designed to safely and securely handle and control nuclear material not only for the personnel working in the facility but also for the public, even in major postulated accidents. The CMRR facility is being designed for personnel to safely handle all forms of plutonium, including bare metal. Dealing with special nuclear materials such as plutonium re-

quires high levels of security and safety, requiring multiple, redundant safety systems and security features. All of these requirements tend to increase the facility cost.

Dr. MILLER. The NNSA facilities are one-of-kind facilities that have never been built anywhere in the world before in most cases. Regardless of the design and engineering challenges these projects present, I believe they are absolutely critical to our national security. Without both the stockpile stewardship research and development centers and production facilities, the country would not be able to support our nuclear deterrent. I fully recognize that they are costly, but I would also maintain that they are critical to our national security.

Dr. HOMMERT. I defer to Mr. D'Agostino, Dr. Anastasio, and the institutions accountable for executing these MCPs.

35. Senator SESSIONS. Mr. D'Agostino, Dr. Cook, Dr. Anastasio, Dr. Miller, and Dr. Hommert, when does NNSA plan to have better confidence in the cost and schedule for these buildings?

Mr. D'AGOSTINO. NNSA will gain more confidence in the cost and schedule for UPF and CMRR as the designs mature. The design is maturing at a rate of approximately 1 percent-2 percent per month. Both projects are on schedule and will be ready to establish project cost and schedule baseline (CD–2) in fiscal year 2013 after they have achieved 90 percent design completion. I will only approve the baselines once the project teams have sufficiently demonstrated and DOE support offices have validated that the projects can be delivered at the CD–2 specified level of cost, schedule, and defined scope.

Dr. COOK. I agree with Mr. D'Agostino and add that a requirement of CD–2 approval includes an External Independent Review and ICE that supports, and provides additional confidence in, the proposed cost and schedules.

Dr. ANASTASIO. The next major step in the CMRR NF will be when the performance baseline is set at 90 percent complete, currently planned for mid-fiscal year 2013.

Dr. MILLER. I understand that the NNSA has worked diligently to address this very question and is moving toward obtaining more frequent ICEs during the critical decision process, as well as hiring and training professional large scale project managers. I would respectfully defer to NNSA for a more detailed answer.

Dr. HOMMERT. I defer to Mr. D'Agostino, Dr. Anastasio, and the institutions accountable for executing these MCPs.

36. Senator SESSIONS. Mr. D'Agostino, Dr. Cook, Dr. Anastasio, Dr. Miller, and Dr. Hommert, what steps are being taken to ensure that taxpayers' dollars will be spent wisely and that the buildings will come in on time and at cost?

Mr. D'AGOSTINO. The UPF and CMRR project teams are continually being challenged to identify cost effective opportunities while meeting all operational, safety, and security requirements. NNSA has supported numerous internal and external reviews to identify cost savings and validate that the requirements are current and support mission deliverables. NNSA will continue to challenge the projects to find more savings and to ensure that the proposed costs are appropriate for all elements of the projects' scope.

Dr. COOK. I agree with Mr. D'Agostino. As an example of our commitment, DOD is currently conducting an independent review of CMRR and UPF to validate the costs of the project scopes. NNSA has established that the upper ends of the cost range estimates represent the maximum Total Project Costs for the projects, and that cost growth beyond these figures will not be supported. If the costs trend toward the upper end of the cost estimate ranges, NNSA is prepared to make scope adjustments as needed to maintain mission capabilities. As detailed in the DOE/DOD Memorandum of Agreement on DOD's funding for NNSA, another approach if costs increase is to slip schedules to the right.

Dr. ANASTASIO. Los Alamos recognizes that the Nation is confronted with very serious financial challenges and is committed to spending taxpayers' dollars wisely. We have assembled a strong team to design and construct this facility. I personally evaluate the CMRR project and we have driven the budgeted cost of this facility down over the last year. In addition, we support a large number of reviews that evaluate our plan and have learned from lessons from other MCPs.

Dr. MILLER. I understand that the NNSA has worked diligently to address this very question and is moving toward obtaining more frequent ICEs during the critical decision process, as well as hiring and training professional large-scale project managers. I would respectfully defer to NNSA for a more detailed answer.

Dr. HOMMERT. While, as indicated above, we are not directly involved in the detailed cost and schedule planning for these facilities, we strongly support the NNSA

decision to apply rigorous project management tools and approaches to these MCPs. At Sandia, we are proud of our track record in completing MCPs ahead of schedule and under budget (for example with our MESA facility in 2007) and if called upon, we stand ready to support the NNSA with our relevant experience in this area.

37. Senator SESSIONS. Mr. D'Agostino, Dr. Cook, Dr. Anastasio, Dr. Miller, and Dr. Hommert, if Congress were to not provide funding for CMRR and UPF, what are some of the anticipated consequences to the nuclear stockpile and weapons complex?

Mr. D'AGOSTINO. Delaying UPF and CMRR places our ability to execute the current LEP schedule at a high risk—that risk will continue to increase every year. Nuclear component work would need to be performed in existing facilities like Building 9212 at Y–12 and the Chemistry and Metallurgy Research (CMR) Facility at Los Alamos. However, the safety, security, and environmental issues associated with the aging existing facilities are mounting, as are the costs of addressing them. NNSA manages the risks associated with the aging facilities and will continue to do so, but as the facilities and their equipment continue to age, the ability to maintain them will diminish. NNSA will of course exhaust all options for keeping these facilities open until a new UPF and CMRR have been constructed. However, in the event that either of these facilities had to be shut down due to safety, security, or environmental concerns, the loss of work force and critical skills would be considerable, and it would likely be extremely expensive to restart operations. If there are delays in delivery of the CMRR and UPF, significantly more maintenance and infrastructure improvement measures would be needed in the existing facilities, at a significant cost, to avoid a potential shut down and ensure NNSA can meet delivery schedules for LEPs.

For the manufacture of plutonium pits, the current CMR facility has limited analytical capability, and the PF–4 vault is inadequate. Therefore, NNSA will not be able to achieve the required 80 pits per year rate until the new CMRR facility is in operation. This capability is required for the W78 LEP by 2021.

Dr. COOK. I agree with Mr. D'Agostino.

Dr. ANASTASIO. We cannot continue to operate the current CMR facility forever because of inherent safety risks of a 60+ year old facility that will continue to increase into the future. Los Alamos has already closed three wings of CMR by transferring mission work to TA–55 and curtailing other activities. The CMRR facility will support many programs involving plutonium and other actinides for decades to come. Those programs include direct support for the stockpile including support to the pit production activities in TA–55/PF4, weapons complex, nonproliferation and counterproliferation programs, counterterrorism, energy programs, and plutonium science. Impacts can be significant, including the inability to support these required mission programs.

Dr. MILLER. The fiscal year 2011 and 2012 budgets represent a positive first step toward reversing the recent declining budget trends and revitalizing the nuclear weapons complex necessary to maintain the U.S. nuclear deterrent. The requested budget increase for the NNSA Weapons Activities account balances the funded program of work across the three primary areas in the SSP: (1) the science and technology that underpins our understanding of an aging stockpile and supports a reinvigorated surveillance program; (2) the LEPs that are necessary to keep the systems safe, secure and effective; and (3) the modernization of the facilities and infrastructure. Funding shortfalls in any one of the three primary areas of SSP will likely impact the other elements of SSP. For instance, if Congress were not to provide funding for the CMRR facility and the UPF, the LEPs would be impacted. More specifically, the availability of CMRR could affect the extent to which new safety and security features are introduced into the stockpile, the performance margin of the LEP, and the interoperability between systems like the W78 and W88.

Dr. HOMMERT. The Stockpile Stewardship and Management Plan (SSMP) assumes the availability of these facilities in the early to mid 2020s. A fundamental change to the SSMP plan for the stockpile would be required if Congress decided not to provide the required funding. An alternative approach for ensuring U.S. capabilities for working with Special Nuclear Materials (SNM) would need to be developed and funded.

38. Senator SESSIONS. Mr. D'Agostino, Dr. Cook, Dr. Anastasio, Dr. Miller, and Dr. Hommert, given the long list of LEPs over the next 20-plus years, how could a delay in the construction of CMRR and UPF impact future LEPs?

Mr. D'AGOSTINO. Delaying UPF and CMRR places our ability to execute the current LEP schedule at a high risk—that risk will continue to increase every year. Nuclear component work would need to be performed in existing facilities like

Building 9212 at Y–12 and the CMR Facility at Los Alamos. However, the safety, security, and environmental issues associated with the aging existing facilities are mounting, as are the costs of addressing them. NNSA manages the risks associated with the aging facilities and will continue to do so, but as the facilities and their equipment continue to age, the ability to maintain them will diminish. NNSA will of course exhaust all options for keeping these facilities open until a new UPF and CMRR have been constructed. However, in the event that either of these facilities had to be shut down due to safety, security, or environmental concerns, the loss of work force and critical skills would be considerable, and it would likely be extremely expensive to restart operations. If there are delays in delivery of the CMRR and UPF, significantly more maintenance and infrastructure improvement measures would be needed in the existing facilities, at a significant cost, to avoid a potential shut down and ensure NNSA can meet delivery schedules for LEPs.

For the manufacture of plutonium pits, the current CMR facility has limited analytical capability, and the PF–4 vault is inadequate. Therefore, NNSA will not be able to achieve the required 80 pits per year rate until the new CMRR facility is in operation. This capability is required for the W78 LEP by 2021.

Dr. COOK. I agree with Mr. D'Agostino.

Dr. ANASTASIO. Future plans for LEPs will require replacement pits to be produced in the TA–55/PF4 building. While CMRR will not produce pits, this facility does provide the science to ensure that TA–55 pits meet the exacting chemistry and material properties needed to ensure the pits will function as designed. As such, a delay in CMRR construction creates significant delays in completion of delaying future LEPs.

Dr. MILLER. A delay in CMRR and/or UPF could impact the range of options under consideration for the upcoming LEPs. Today, the production complex is capable of producing components for weapons refurbishments. However, the facilities that CMRR and UPF will replace are more than 50 years old, oversized, increasingly obsolete, and costly to maintain. They are also safety, security, and environmental concerns. When completed, both CMRR and UPF will be able to operate more efficiently in support of the nuclear weapons enterprise. While the B61–12 is independent of CMRR and UPF construction, a delay in CMRR could have an impact on replacement or reuse design options for the W78 LEP. The availability of CMRR could affect the extent to which new safety and security features are introduced into the stockpile, the performance margin of the LEP, and the interoperability between systems like the W78 and W88.

CMRR's original construction completion date has been pushed out to the early 2020s according to the current schedule. LANL and LLNL continue to work with NNSA to ensure that sufficient capability for plutonium R&D is available to accommodate the workload of the complex to support the LEPs while CMRR is under construction. These same R&D capabilities are also required should the country need to characterize and/or attribute a nuclear terrorism related event. The country has no other capable facilities outside of the NNSA design laboratories.

Dr. HOMMERT. The current sequence and timing of the LEPs called for in the Nuclear Posture Review (NPR) and documented in the SSMP would not be achievable, and would need to be revised. Delays in the LEPs for certain systems could impact our confidence in the state of health of the US nuclear deterrent.

39. Senator SESSIONS. Mr. D'Agostino, Dr. Cook, Dr. Anastasio, Dr. Miller, and Dr. Hommert, what is being done with respect to conducting an ICE for each facility?

Mr. D'AGOSTINO. Both UPF and CMRR project teams have ongoing ICEs being performed. The GAO has performed an independent review of the UPF project, and the UPF project team retained the US Army Corp of Engineers (USACE) to conduct an ICE for the project. The USACE results are being examined and compared to the project team's cost estimate to reconcile differences. The GAO has initiated a review of the CMRR project. The cost range estimates for CMRR and UPF are being independently validated by the DOD's Cost Analysis and Program Evaluation (CAPE) group.

Furthermore, in accordance with DOE 413.3b, an External Independent Review (EIR) is required as part of CD–2 approval. For projects such as UPF and CMRR that are greater than $100 million, an ICE is a required component of the EIR and must validate the proposed total project costs. The EIR, conducted by the DOE's Office of Engineering and Construction Management, must validate the proposed scope, cost and schedule baselines as a condition of CD–2 approval.

Dr. COOK. In addition, an independent cost reasonableness review was conducted on both projects in July 2010. The cost reasonableness review concluded that the process and steps that were being exercised to establish cost estimates is appro-

priate. Also, the former Office of Cost Analysis conducted an ICE on UPF and an initial review of CMRR. All reviews—the ones cited by the Administrator and myself plus others to be done as the cost estimates mature—will be considered in the final budgeting for both projects.

Dr. ANASTASIO. We continue to support a large number of reviews of the CMRR, including DOD, Defense Nuclear Facilities Safety Board (DNFSB), GAO, and Independent Cost Evaluations (ICE). We expect to support comprehensive ICE reviews as the project proceeds to baselining in 2012 and 2013. In addition, the project will continue to support reviews throughout the Construction Execution Phase.

Dr. MILLER. I would respectfully defer to my colleagues at the NNSA for specific information on the cost estimates for the UPF at Y–12 and the CMRR facility at LANL.

Dr. HOMMERT. I defer to Mr. D'Agostino, Dr. Anastasio, and the institutions accountable for executing these MCPs.

40. Senator SESSIONS. Mr. D'Agostino, Dr. Cook, Dr. Anastasio, Dr. Miller, and Dr. Hommert, in what way will CMRR and UPF influence U.S. Strategic Command's (STRATCOM) requirements for the overall size of the stockpile?

Mr. D'AGOSTINO. As described in the NPR, the non-deployed stockpile currently includes more warheads than required to hedge against technical or geopolitical surprise, due to the limited capacity of the NNSA complex to conduct LEPs for deployed weapons in a timely manner. Progress in restoring NNSA's production infrastructure will allow these excess warheads to be retired along with other stockpile reductions planned over the next decade.

Dr. COOK. I agree with Mr. D'Agostino.

Dr. ANASTASIO. The CMRR facility will support many programs involving plutonium and other actinides. Those programs include direct support for the stockpile, weapons complex, nonproliferation and counter-proliferation programs, counter-terrorism, energy programs, and plutonium science. It is important to note that CMRR will not produce pits but will provide the science to ensure that pits manufactured at TA–55/PF–4 meet the exacting chemistry and material properties needed to ensure the pits will function as designed. STRATCOM's current, and projected stockpile size requirements will be supported, as required with manufacturing in TA–55/PF–4 building. While the CMRR facilities size is capability based, a small capacity for the stockpile is inherent in the capability base.

Dr. MILLER. This question is best answered by STRATCOM. I would note that even though today the production complex is capable of producing components for warhead refurbishments, the facilities that the CMRR facility and the UPF will replace are more than 50 years old, oversized, increasingly obsolete, and costly to maintain. They are also safety, security, and environmental concerns. Confidence in and demonstrated performance of the production complex is clearly important in the sizing of the stockpile with respect to its ability to respond to future strategic policy uncertainties and the need to protect against technological failures in the stockpile itself.

Dr. HOMMERT. These facilities are part of the NNSA plan for a responsive infrastructure. In principle, a responsive infrastructure could enable a smaller hedge force which would be consistent with a smaller overall stockpile.

41. Senator SESSIONS. Mr. D'Agostino, Dr. Cook, Dr. Anastasio, Dr. Miller, and Dr. Hommert, without these facilities, would NNSA be able to meet STRATCOM's current warhead requirements?

Mr. D'AGOSTINO and Dr. COOK. Should NNSA not have access to the capabilities in the planned new facilities, the ability to produce uranium components and conduct analysis for pit certification would be limited to rates existing today, which would erode as the existing facilities decay. Our ability to support the stockpile and the planned LEPs would be jeopardized. Without UPF and CMRR, it's not a question of whether these capabilities would be lost, but only when. Although NNSA is taking all measures to continue to operate the existing facilities, their age and single point of failure capability raise the costs of safe operation each year and will eventually exceed NNSA's ability to keep them operational.

Furthermore, CMR presently enables the National Laboratories to conduct surveillance of plutonium components in the stockpile. Should the facility become unusable, it will negatively impact our ability to assess and certify the status of the current stockpile.

Dr. ANASTASIO. Without these facilities, STRATCOM's requirements for extended life warheads starting with the W78 LEP will be significantly impacted if the replacement option is selected by the DOD and funded by Congress.

Dr. MILLER. Today, the production complex is capable of producing the required components for current warhead refurbishments underway. However, the facilities that the CMRR facility and the UPF will replace are more than 50 years old, oversized, increasingly obsolete, and costly to maintain. They are also safety, security, and environmental concerns. When completed, both CMRR and UPF will be able to provide components more efficiently. A delay in CMRR and/or UPF could impact the range of options for the upcoming LEPs and the ability of LEPs to meet new military requirements.

Dr. HOMMERT. The current NNSA plan calls for these facilities to become operational in the 2020s. In the near term, the stockpile can and will be maintained with existing facilities to meet requirements. However, these facilities will be needed to meet anticipated future requirements.

SSBN(X) LIFE OF HULL REACTOR

42. Senator SESSIONS. Admiral Donald, what is the current technology readiness level for the life of hull reactor anticipated for the SSBN(X)?

Admiral DONALD. Naval nuclear reactor designs are evolutionary rather than revolutionary. The reactor for *Ohio* Replacement SSBNs will incorporate technologies that provide greater energy and a longer lifetime than any previous submarine core.

Initial development of the materials required to achieve the life-of-ship core were part of previous research, design and manufacturing efforts. The knowledge gained from these efforts identified the additional steps needed to be ready for production. Naval Reactors is confident in the feasibility of the life-of-ship core and will validate this through rigorous testing and manufacturing demonstrations. A final decision on the core material for *Ohio* Replacement is planned to be made in February 2012 based on manufacturing demonstrations to date.

While Naval Reactors has not historically used technology readiness levels to manage its technical efforts, the Program judges that the life-of-ship core technology would represent a level 5 (component and/or breadboard validation in a relevant environment). This assessment is based on the fact that a prototype test cell incorporating the new material has been inserted in an operating, land-based reactor plant. Manufacturing development at the ship-production scale needs to be demonstrated.

43. Senator SESSIONS. Admiral Donald, how are the requirements for the life of hull reactor design for SSBN(X) different from those in current *Virginia*-class submarines?

Admiral DONALD. SSBNs spend more time at sea than SSNs in order to meet the requirements for strategic patrols. *Ohio* Replacement will also be designed for a life of 42 years, vice 33 for *Virginia*. The *Ohio* Replacement core will operate at sea for more than twice as many days as *Virginia*'s core. In order to achieve this increase in energy and lifetime demand, Naval Reactors is designing a core with new materials based on previous research. A more detailed, classified briefing can be provided.

44. Senator SESSIONS. Admiral Donald, I understand that the current milestone and decision point for determining the technical feasibility of developing a life of hull reactor for SSBN(X) is in February 2012. If it is determined that a life of hull reactor for the SSBN(X) is not possible, how will that impact the overall number of boats required to meet STRATCOM requirements?

Admiral DONALD. The resources in our DOE budget are based on completing the additional development needed to ensure success of production of a life-of-ship core in *Ohio* replacement. Without a life-of-ship core, two additional ships will be required to meet STRATCOM's requirements, thereby costing taxpayers approximately $10 billion in ship construction.

45. Senator SESSIONS. Admiral Donald, would additional boats be required to compensate for refueling?

Admiral DONALD. Yes. Without a life-of-ship core, two additional ships will be required to meet STRATCOM's requirements, thereby costing taxpayers approximately $10 billion in ship construction.

46. Senator SESSIONS. Admiral Donald, in the House-passed version of H.R. 1, the fiscal year 2011 full year CR, the Energy and Water Subcommittee of the House Appropriations Committee cut the President's fiscal year 2011 NR budget by $103 million. What is the anticipated impact of that reduction?

Admiral DONALD. The $103 million cut proposed in H.R. 1 grew to $111 million in P.L. 112–10 signed by President Obama on 15 April 10. The impacts of that $111 million cut are as follows:

- a 6- to 9-month delay to the *Ohio* Replacement Program and resultant loss of synchronization with the Navy's work on the ship.
- staffing reduction of over 50 contractors at shipyards and Naval Reactors' laboratories.
- deferral in planned hiring of 150 contractors at shipyards and Naval Reactors' laboratories.
- deferral in *Ohio* Replacement reactor plant component design subcontract placements.
- a reduction in pension contributions.
- other impacts to Naval Reactors, including deferral of previously planned General Plant Projects (GPP).

QUESTIONS SUBMITTED BY SENATOR JOHN CORNYN

PANTEX PLANT

47. Senator CORNYN. Mr. D'Agostino, on July 7, 2010, the Pantex Plant was impacted by a severe thunderstorm, causing significant flooding throughout the plant, as well as equipment and facility damage. Pantex received $8.8 million in fiscal year 2010 for flood recovery efforts. It is my understanding that Pantex requires an additional $17.2 million for repair and recovery efforts, as well as $2.25 million to mitigate the impact of future flood events. The President's fiscal year 2012 budget request for operating requirements at Pantex is $649.3 million. Does this figure cover all remaining flood repair, recovery, and mitigation efforts required at Pantex?

Mr. D'AGOSTINO. The Pantex rain event occurred in July 2010, after the fiscal year 2011 President's budget had been submitted to Congress. NNSA committed $8.8 million in fiscal year 2010 for immediate flood recovery efforts. This funding, along with Pantex internal efficiencies, addressed the most critical issues faced by the site to restoring operations. NNSA continues to evaluate the available fiscal year 2011 funding in the RTBF program, and will work to determine the best option for addressing the most urgent needs. The President's fiscal year 2012 budget request includes $164.8 million for Pantex RTBF Operations of Facilities, which is sufficient to fund any remaining flood repair, recovery, and mitigation activities.

48. Senator CORNYN. Mr. D'Agostino, the fiscal year 2012 budget request also covers resumption of work on a new 45,000-square-foot high-explosives pressing plant at Pantex. Design work for this facility was completed in 2009 and then put on hold, and it is my understanding that projected completion of this project is now by 2017. What is the current timeline for construction, and what is your department doing to ensure that no further delays are experienced?

Mr. D'AGOSTINO. The project completion date is now September 2016. An External Independent Review (EIR) has been conducted to validate the new cost and schedule and the project's baseline revised per the EIR findings. Costs have increased due to the need to add more contingency for risk and the added cost escalation due to delay. The United States Army Corps of Engineers (USACE) is the Construction Services Manager and will manage the cost, schedule and technical performance of this project to ensure no further delays and cost overruns are experienced. The USACE has received bids for the project on March 1, 2011 and expects to award the construction contract in third quarter fiscal year 2011. The contract will be a firm-fixed price contract with fixed cost and completion date.

49. Senator CORNYN. Mr. D'Agostino, according to the 2009 report by the Congressional Commission on the Strategic Posture of the United States, "excessive regulation originating outside the NNSA but within a risk-averse DOE was raising cost and hampering production at Pantex." The report found that two broad attitudes are often cited as contributing to excessive regulation: "the failure of the NNSA and DOE to distinguish between what to do (a government function) and how to do it (a contractor responsibility)," as well as the government's "tendency to respond to problems by imposing new rules that will 'guarantee' that the problem does not recur." What efforts have the NNSA and DOE taken to alleviate this excessive regulation, promote production, and reduce costs at Pantex?

Mr. D'AGOSTINO. In 2009, I established and chaired a Governance Board consisting of senior leaders from NNSA and its contractors to develop an approach to transforming the way we govern our contractors and ourselves. The efforts of the

Board resulted in a number of short- and long-term actions to drive transformation in governance and oversight programs. The ultimate goal of these actions is to streamline how NNSA does business and allow resources to be focused and directed in a way that maximizes mission accomplishment, while ensuring that safety and security are integral components of that mission.

Upon completion of the governance and oversight transformation effort, NNSA expects to have the following:

- Clearer roles, responsibilities, and accountability
- Stronger Contractor Assurance Systems
- Better balanced Federal requirements
- More focused, integrated, effective and efficient Federal and contractor oversight systems, and
- Improved contractual performance accountability

The effort to better balance Federal requirements directly addresses the concern regarding the "two attitudes" cited from the 2009 report by the Congressional Commission on the Strategic Posture of the United States. NNSA has implemented a number of changes to its contract requirements to address duplication and redundancy in requirements and to eliminate unnecessary prescription. NNSA established the expectation that a team of senior managers review proposed new requirements or changes to requirements promulgated by DOE. As part of its review, the team ensures new or modified requirements focus on performance outcomes. The team also helps ensure those requirements are not an inappropriate response to addressing a performance problem at an individual site. This team of managers has worked with other DOE organizations responsible for internal requirements and regulations to effect significant change in those requirements; many of the changes address the concerns raised in your question. However, this is a work in progress as the same pressures and attitudes that led to the concerns raised by the Commission still exist internal and external to NNSA and DOE.

DOE has also undertaken initiatives to improve its requirements. In 2010, the Deputy Secretary initiated DOE's 2010 Safety and Security reform effort. This effort is intended to streamline DOE requirements in the areas of safety and security. NNSA has worked with DOE on this effort. As part of the security reform initiative, and in partnership with the DOE's Office of Health, Safety and Security, NNSA has completed the initial phase of a Zero-Based Security Review that will improve NNSA's ability to implement its nuclear security mission while maintaining a robust security posture at all of its sites. These reforms will demonstrate to Congress and others that the NNSA effectively accomplishes its safety and security requirements in a manner that is reasonable, defensible, and consistent across the Nuclear Security Enterprise.

NATIONAL LABORATORIES

50. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, was there an assessment made 4 years ago that the W78 should be replaced within a decade, meaning that weapon won't begin replacement work until 6 years after you stated it needs to be replaced?

Dr. ANASTASIO. The W78 warhead entered the stockpile in 1980. LANL has been monitoring the health of the W78 since then, principally through the surveillance program, which includes flight testing. In each of the last 15 years, the Laboratory has issued a W78 annual assessment report, and the respective Laboratory Directors have issued an annual assessment letter that included the W78.

LANL has been monitoring one particular W78 aging characteristic for over a decade. When I became Director in 2006, and annually thereafter, I received technical briefings on the health of all the warheads and bombs for which LANL is responsible, including the W78. I mentioned this aging issue in my first annual assessment letter (2006) and updated my comments and assessment each year thereafter.

In my 2007 annual assessment letter, I recommended that the W78 be replaced or enter a comprehensive life extension activity to correct this specific aging condition, but I did not specify a timeframe for execution.

Dr. MILLER. LANL has been monitoring the W78's aging characteristics and has assessed that aging "has not affected the safety, reliability, or performance of the W78 to date;" however, "the condition is progressive and beyond current predictive capabilities." LANL Director Dr. Michael Anastasio first made this assessment about 4 years ago and at that time stated that a life extension would be needed within a decade. LLNL has concurred with these concerns in our peer review role as part of the annual assessment process. Issues identified include material aging

and compatibility issues, which can impact components within the nuclear explosive package (NEP).

The W78 warhead constitutes the majority of the ICBM leg of the triad and has been deployed on the Air Force's Minuteman III for more than 31 years. It is beyond its planned service life and requires a 10 year effort to study and then refurbish the necessary systems. It is important to begin the study activities on the W78 LEP in order to explore options to extend this warhead's life to address concerns identified in surveillance of W78 warheads and reported in annual assessments. An important function of the study is to evaluate the different approaches available to refurbish the warhead—as were outlined in the NPR—and also to assess the impacts of including additional safety and security features.

Dr. HOMMERT. The technical issue driving the need for a life extension of the W78 warhead is associated with the NEP which is the design responsibility of LANL. I defer to Dr. Anastasio regarding the assessment of the W78 issue and the timelines required for the life extension. Regarding Sandia design responsibilities, we perform tests and analyses on the non-nuclear components and subsystems each year, adding data to the technical basis for assessing whether the requirements for the W78 warhead are met. Our current assessment, based on 30 years of data collected, is that we see no evidence of degradation of the non-nuclear components that would require their urgent replacement. However, the Sandia designed electronics in the W78 warhead are now 30 years old and we believe it would be prudent to replace them when a LEP is undertaken for the warhead. The insertion of modern non nuclear technologies will likely be required to enable surety improvements and flexibility in Nuclear Explosive Package (NEP) options.

51. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, what prompted that statement?

Dr. ANASTASIO. In my 2007 annual assessment letter, I recommended that the W78 be replaced or enter a comprehensive life extension activity to correct a specific aging condition, but I did not specify a timeframe for execution.

The basis for that statement in 2007 was my assessment of the surveillance and research that had been accomplished. The specific aging condition is progressive and must be addressed in the future.

The basis for that statement in 2007 was my assessment of the surveillance and research that had been accomplished. The specific aging condition is progressive and must be addressed in the future.

Dr. MILLER. LANL has been monitoring the W78's aging characteristics and has assessed that aging "has not affected the safety, reliability, or performance of the W78 to date;" however, "the condition is progressive and beyond current predictive capabilities." LLNL has concurred with these concerns in our peer review role as part of the annual assessment process. Issues identified include material aging and compatibility issues, which can impact components within the NEP. The classified LANL Annual Assessment Letters, starting in fiscal year 2004 through the present (fiscal year 2010), offer the best detailed classified summary overview regarding the recent history associated with the warhead. The W78 warhead is already well beyond its planned service and requires a 10-year effort to complete the life extension options study and physical refurbishment of the warhead.

Dr. HOMMERT. Please see my response to QFR #50.

52. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, has your assessment of the W78 changed in the following years?

Dr. ANASTASIO. Additional surveillance data and analysis has improved the Laboratory's understanding of this condition. However, my assessment that the W78 should be replaced or undergo a comprehensive life extension activity has not changed.

Dr. MILLER. No, LLNL's assessment has not changed. The W78 warhead is beyond its original design lifetime. Material aging and compatibility concerns increase as warheads continue to age and concerns about other possible changes invariably grow as a warhead type exceeds its original design lifetime. Results from surveillance of W78 units have identified issues associated with material aging and compatibility, which have the potential to impact components within the NEP. This has resulted in increased attention on this warhead by LANL. The classified LANL Annual Assessment Letters, starting in fiscal year 2004 through the present (fiscal year 2010), offer the best detailed classified summary overview regarding the recent history associated with the warhead.

Dr. HOMMERT. Please see my response to QFR #50.

53. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, how long have you recognized the aging and reliability concerns found in the W78?

Dr. ANASTASIO. The specific W78 aging issue was first reported in an annual assessment letter by then-Director John C. Browne.

LANL assesses that this aging issue has not affected the safety, reliability or performance of the W78 to date.

Dr. MILLER. LANL has been monitoring the W78 aging characteristics and has assessed that aging "has not affected the safety, reliability, or performance of the W78 to date;" however, "the condition is progressive and beyond current predictive capabilities." Dr. Anastasio first made this assessment about 4 years ago and at that time stated the life extension would be needed with a decade. LLNL has concurred with these concerns in our peer review role as part of the annual assessment process. Issues identified include material aging and compatibility issues, which can impact components within the NEP. The classified LANL Annual Assessment Letters, starting in fiscal year 2004 through the present (fiscal year 2010), offer the best detailed classified summary overview regarding the recent history associated with the warhead.

Dr. HOMMERT. Please see my response to QFR #50.

54. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, what is the consequence of additional delays in the start of the LEP study, if for example the study does not commence in fiscal year 2011?

Dr. ANASTASIO. Delaying the start of the W78 LEP study results in delaying the work that will be required to extend the life of the system. Within the limited nuclear weapons complex capabilities, delays in the W78 LEP schedule will delay future LEPs.

We have been delaying the start of the W78 life program for several years. The specific condition in the W78 is progressive and must be addressed in the future. The longer we delay the LEP, the greater the risk is to the W78 and the missions that this weapon supports. As I mentioned earlier, at the current time, LANL assesses that this aging issue has not affected the safety, reliability or performance of the W78.

Dr. MILLER. There are a number of potential consequences associated with delays in starting the LEP study for the W78 warhead, which would, in turn, delay start of the effort to refurbish this vitally important weapon system that is already beyond its design life. At the highest level, delaying the study will increase the risk of meeting the proposed first-production-unit which is currently slated for fiscal year 2021. In addition, delays will also put at risk achieving the high level goals currently being put forward for the warhead attributes associated with this life extension (for example improving warhead safety, security, and use control). Delays in initiating the W78 LEP study would also impact the ongoing joint Navy and Air Force effort to develop a common Arming, Fusing, and Firing assembly for their respective reentry vehicles. Delays in the W78 study will also result in missing the opportunity to work synergistically with the ongoing B61–12 LEP to develop and mature technologies and processes that could potentially be used in both warhead life extensions.

Dr. HOMMERT. Please see my response to QFR #50.

55. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, is the W78 the most likely candidate for a "replacement" LEP?

Dr. ANASTASIO. The W78 is the first possible candidate for a "replacement" LEP, as the W76–1 LEP is currently being built, and the B61 is not designed as a "replacement" LEP. With regards to the W78 LEP, many options have been proposed as possible solutions for the W78 LEP, but until the study is complete it is impossible to decide what the optimal solution is. LLNL has the responsibility for this LEP. Los Alamos will provide a critical analysis of any options that LLNL proposes in this process (red-teaming the design).

Dr. MILLER. LLNL looks forward to commencing the study on the W78 LEP. At this time it would be premature to decide which life extension option (refurbishment, reuse, or replacement) is the best technical option for the Laboratory to present to leadership in the Departments of Energy and Defense.

Based on direction from the Secretary of Energy and the NNSA Administrator, the laboratories will explore all options. With information at hand on all options, stockpile decisions will be based on U.S. national security and stockpile requirements, informed by our best scientific judgment, and consistent with the guidance contained in the NPR and the plans outlined in the Stockpile Stewardship and Management Plan. I consider it my critical responsibility as a Laboratory Director to as-

sure that all options authorized by Congress and the President are explored when LEPs option are evaluated.

Dr. HOMMERT. Per the national policy guidance in the NPR, the full range of options will be considered for the W78 LEP, and a "replacement" approach would require Presidential authorization. The final decision on which LEP approach is best for a given warhead is based primarily on characteristics of the NEP, and I therefore defer to Dr. Miller.

56. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, can you explain why it is important to study the W88 warhead, in terms of potential commonality with the W78 LEP?

Dr. ANASTASIO. One of the advantages of having a warhead that is compatible with both delivery systems (ICBMS and SLBMs) is that it allows different options to address potential and or unanticipated failures in the stockpile. The laboratories have examined the possibility of common adaptable warheads for a variety of applications over several decades. The key issue in all these evaluations is "how common do the warheads need to be?"

The studies indicate that if the goal is to maintain a credible deterrent with fewer warheads in the stockpile, stockpile diversity is critical. Ideally, the design of the physics packages for the W78 and W88 should be different yet able to fit and fly in "common" reentry bodies.

Dr. MILLER. A high level goal for all future LEPs is to develop options that would enable the life-extended warhead to be used in multiple delivery platforms. We need to explore if this is a viable approach to reducing the number of different warhead types in the future stockpile without adversely impacting overall stockpile reliability, and if this approach offers the potential to reduce the number of hedge (non-deployed) warheads required. For the W78 LEP, this goal entails developing options that would enable the resulting warhead to be interoperable with (able to be used in) the Air Force Mk12 A and the Navy Mk5 reentry vehicles. (The W88 is currently fielded in the Mk5 Reentry vehicle.) Therefore, this requires the W78 LEP to address the life cycle/stockpile-to-target requirements for both of these warheads and both delivery vehicles and missile systems.

Dr. HOMMERT. The NPR recommends "initiating a study of LEP options for the W78 ICBM warhead, including the possibility of using the resulting warhead also on SLBMs to reduce the number of warhead types." The development of an interoperable warhead that could be mated to either an ICBM or SLBM delivery platform would support a hedge strategy that includes "cross-leg" hedging which would allow desired reductions in the size of the overall stockpile. Cross leg hedging means that a weapon system from one leg of the triad would be used to cover a shortfall created from a systemic defect or problem in a weapon system from another leg of the triad.

A feasibility study of a common Arming, Fuzing, and Firing (AF&F) system for the W78/Mk12A and W88/Mk5 warheads was conducted by Sandia with excursions that examined extensions of the AF&F for high-surety warheads and the existing W87/Mk21 system. This 90-day study, which was completed in February 2010, considered enveloped functional and environmental requirements that were derived from Air Force, Navy, and STRATCOM inputs. While it is not possible to make one AF&F that can be used without modification on multiple delivery platforms or reentry systems, the study found that significant levels of AF&F commonality are possible with existing system architectures and enable additional surety features compatible with the existing NEPs and future high-surety warhead designs. The results of this Sandia study will be incorporated into the W78 LEP Phase 6.1 study once it is authorized by Congress.

57. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, is there capacity in the enterprise to undertake an LEP on the W80?

Dr. ANASTASIO. The complex has limited capacity to execute several LEPs at the same time. In addition, several LEPs are needed in the next decade. It is critical for the DOD and NNSA to work out the national priorities in the context of limited resources. If it is a national priority to do the W80 LEP simultaneously with the other LEPs, there will be significant cost impacts and likely LEP schedule impacts as the nuclear weapons enterprise works towards increasing its capacity.

Dr. MILLER. The current NNSA LEP Plan includes the W80 undergoing a life extension in 2030. NNSA continually reviews the scheduling of LEPs with the aim of best supporting the U.S. nuclear deterrent.

Dr. HOMMERT. The current Stockpile Stewardship and Management Plan sustains the W80 in the U.S. stockpile through the end of the next decade, with an LEP or another Long-Range Standoff option activity at that point in time. If this timing

holds, there should be capacity in the enterprise to undertake this work. In the meantime, a strong surveillance program for the W80 is essential.

58. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, what risks is the United States taking in view of the current status of that warhead?

Dr. ANASTASIO. On October 1, 2004, the NNSA transferred design agency responsibility for the W80 warhead from LANL to LLNL. In May 2006 Nuclear Weapons Council (NWC) decided to cancel the LEP for the W80.

Dr. MILLER. LLNL has certified the W80 for a planned service life through 2030, barring any unforeseen issues with the system. Like the W78, a life extension of the W80 will require a 10-year effort for study of options and refurbishment. If a critical performance issue were to be identified, a delay in commencing the life extension could affect the status of the system.

The risk to the stockpile is best mitigated by a balanced and well-funded SSP, which increases the nuclear weapons enterprise's agility and ability to adapt to unforeseen events. The fiscal year 2011 and fiscal year 2012 budget increases are positive first steps toward revitalizing the nuclear weapons complex necessary to maintain the U.S. nuclear deterrent, reversing the recent trend of declining budgets, and manage risk. The requested budget increase to the NNSA Weapons Activities account balances the funded program of work across the three primary areas in the SSP: (1) the science and technology that underpins our understanding of an aging stockpile and supports a reinvigorated surveillance program, (2) the LEPs that are necessary to keep the systems safe, secure and effective; and (3) the modernization of the facilities and infrastructure.

Dr. HOMMERT. In Sandia's non nuclear component space, concerns about technology obsolescence and aging are significant. We have very limited data associated with components fielded for more than 30 years. Our current experience with the B61 indicates an increasing likelihood of degradation and performance impacts as components age.

59. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, when will the CMRR and UPF be required for the W78 production?

Dr. ANASTASIO. Many options have been proposed as possible solutions for the W78 LEP, but until the study is complete it is impossible to decide what the optimal solution is. CMRR will be available to support pit production in TA–55/PF–4 starting no later than 2023 if the pit replacement option for the W78 is selected by the NNSA and approved and funded by Congress.

Dr. MILLER. The CMRR facility and the UPF are both scheduled to be operational in the 2021–2022 timeframe to support production requirements. This is fully consistent with the current W78 LEP's current production schedule. While it is important that the facilities follow the current schedule to meet its targeted FPU of the W78 LEP, it is equally important that potential cost growth in facility construction does not adversely affect the science and technology that underpins stockpile assessment. A balanced and well-funded SSP is required to support the deterrent. The requested budget increase for the NNSA Weapons Activities account balances the funded program of work across the three primary areas in the SSP: (1) the science and technology that underpins our understanding of an aging stockpile and supports a reinvigorated surveillance program, (2) the LEPs that are necessary to keep the systems safe, secure and effective; and (3) the modernization of the facilities and infrastructure.

Dr. HOMMERT. I defer to Dr. Anastasio and Dr. Miller.

60. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, what are the risks to the stockpile if the facilities follow the current schedule?

Dr. ANASTASIO. Stockpile risks can be grouped in two areas. First, ongoing stockpile stewardship activities (surveillance and manufacturing assessments) that are dependent on the chemistry and materials capabilities planned for the CMRR nuclear facility and currently housed in the existing CMR, a facility that is more than 60 years old. Second, planned schedules for new facilities are being factored into LEP planning such as W78. Given this advanced planning risks to the stockpile are currently manageable. However, pit production in TA–55/PF–4 at the necessary rate cannot be supported by CMRR nuclear facility until 2023.

Dr. MILLER. The risk to the stockpile is best mitigated by a balanced and well-funded SSP, which increases the nuclear weapons enterprise's agility and ability to adapt to unforeseen events. The fiscal year 2011 budget increase is a positive first step toward reversing the recent declining budget trends and revitalizing the nuclear weapons complex necessary to maintain the U.S. nuclear deterrent. The requested budget increase for the NNSA Weapons Activities account balances the

funded program of work across the three primary areas in the SSP: (1) the science and technology that underpins our understanding of an aging stockpile and supports a reinvigorated surveillance program; (2) the LEPs that are necessary to keep the systems safe, secure, and effective; and (3) the modernization of the facilities and infrastructure. Funding shortfalls in any one of the three primary areas of SSP will likely impact the other elements of SSP; hence, affect the deterrent. While it is important that the facilities follow the current schedule and are available for the FPU of the W78 LEP, it is equally important that potential cost growth in facility construction does not adversely affect the science and technology that underpins stockpile assessment.

Dr. HOMMERT. The Stockpile Stewardship and Management Plan (SSMP) assumes the availability of these facilities in the early to mid 2020s. If the facilities follow the current schedule, the enterprise will be able to execute the stockpile LEPs as documented in the SSMP.

61. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, what are the risks to the stockpile if the facilities are delayed?

Dr. ANASTASIO. If the pit replacement option for the W78 is selected by the NNSA, and approved and funded by Congress, the risk to delays will be determined by the existing pit build capacity. Without CMRR's chemistry and analytic capabilities, necessary pit production rates in TA–55/PF–4 cannot be supported, delaying the W78 LEP and future LEPs.

Dr. MILLER. The risk to the stockpile is best mitigated by a balanced and well-funded SSP, which increases the nuclear weapons enterprise's agility and ability to adapt to unforeseen events. The fiscal year 2011 and the fiscal year 2012 budgets are positive first steps toward reversing the recent declining budget trends and revitalizing the nuclear weapons complex necessary to maintain the U.S. nuclear deterrent. The requested budget increase for the NNSA Weapons Activities account balances the funded program of work across the three primary areas in the SSP: (1) the science and technology that underpins our understanding of an aging stockpile and supports a reinvigorated surveillance program, (2) the LEPs that are necessary to keep the systems safe, secure and effective; and (3) the modernization of the facilities and infrastructure. Funding shortfalls in any one of the three primary areas of SSP will likely impact the other elements of SSP; hence, affect the deterrent. While it is important that the facilities follow the current schedule and are available for FPU of the W78 LEP, it is equally important that potential cost growth in facility construction does not adversely affect the science and technology that underpins stockpile assessment.

A delay in the CMRR facility and/or the UPF could impact the range of options for the upcoming LEPs. While the B61–12 is independent of CMRR and UPF construction, a delay in CMRR could have potential impact on replacement or reuse design options for W78 LEP. For the W78 LEP, the availability of CMRR could affect the W78 LEP's performance margin and the potential warhead interoperability between systems like the W78 and W88. Also, the facilities that CMRR and UPF will replace are more than 50 years old, oversized, increasingly obsolete, and costly to maintain, and they are safety, security, and environmental concerns.

Dr. HOMMERT. The current sequence and timing of the LEPs called for in the NPR and documented in the SSMP would not be achievable, and would need to be revised. Delays in the LEPs for certain systems could impact our confidence in the state of health of the US nuclear deterrent.

62. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, do you support the acceleration of the construction of these facilities?

Dr. ANASTASIO. Completing these projects sooner reduces risk to execution of required life extensions. Continuing to rely on greater than 60+ year old facilities to support the Nation's nuclear deterrent cannot be sustained.

Dr. MILLER. In the out-years, the uncertainties associated with the baselines for the planned LEPs and the construction of large facilities are my primary source of concern. Without detailed designs for the CMRR facility and the UPF and the corresponding cost analysis, funding requirements will remain uncertain. The laboratories and plants are working with the NNSA to develop baselines for these projects, but the total costs are not yet known. It is critically important to budget for adequate contingency in large construction projects to ensure sufficient flexibility to accommodate the detailed design issues that typically arise in constructing these complex, one-of-a-kind facilities. It is equally important to ensure that funding for these construction projects does not erode available funding for the science and technology activities that underpin the maintenance and assessment of the U.S. nuclear deterrent.

The fiscal year 2011 and the administration's proposed fiscal year 2012 budget increases are positive first steps toward revitalizing the nuclear weapons complex necessary to maintain the U.S. nuclear deterrent. The nation's nuclear strategy requires a SSP that is balanced, integrated, and sustained over time. The level of investment, consistent with planned nuclear warhead reductions, must grow over time to capitalize construction of essential new facilities; sustain a healthy science, technology, and engineering core; manage the aging stockpile; support an increased level of LEP work; and maintain a critically skilled workforce. Until the baselines are completed, we will not have an accurate and reliable estimation of the resources required. It is clear that sustained effort will be necessary to ensure the appropriate balance within the program across all of its requirements.

Dr. HOMMERT. The current schedule is aligned with the life extension plans for the stockpile and therefore should be sufficient. I don't believe the overall budget profile for the NNSA over the next decade will support both the acceleration of these facilities and the required work on the stockpile.

63. Senator CORNYN. Dr. Anastasio, what steps is Los Alamos taking to accelerate the construction of the CMRR?

Dr. ANASTASIO. The project will be executed in a cost effective and phased manner where possible with available funding. For example, we plan to execute some site preparation activities such as establishing a concrete batch plant while the facility design is finalized. That way, construction can begin once the design is approved and the project receives authorization and the needed appropriations to begin facility construction.

64. Senator CORNYN. Dr. Anastasio, what is your understanding of the timeline for the CMRR to be completed and to be fully operational?

Dr. ANASTASIO. Formal direction from NNSA requires that CMRR be completed no later than 2020 with operation no later than 2023.

65. Senator CORNYN. Dr. Anastasio, why are different completion dates (2020 and 2023) provided in the Section 1251 report?

Dr. ANASTASIO. The 2020 date is for completion of construction. Readiness and startup activities leading to full operation of the analytical chemistry and material characterization operations is 2023.

66. Senator CORNYN. Dr. Anastasio, after your retirement, how many weapon designers at Los Alamos will have direct nuclear test experience?

Dr. ANASTASIO. After I retire there will be 8 nuclear weapon designers at Los Alamos with nuclear test experience. They range in age from 50 to 70 years old and in experience from a single nuclear test to being involved in greater than ten nuclear tests. In addition, we have 10 Laboratory-Affiliate weapon designers (retired staff who work on a part-time basis) with nuclear test experience that helps train the next generation of designers.

67. Senator CORNYN. Dr. Anastasio, what are the risks associated with the eventual condition when no weapon designers will have designed, tested, and deployed a new weapon?

Dr. ANASTASIO. I have confidence in our design experts with and without nuclear weapons testing experience. The upcoming LEPs provide an essential element in continuing to develop new expertise in our design staff. I have also worked to develop new tools and methods for ensuring our confidence in the stockpile in the absence of new nuclear testing opportunities. In addition, the design labs have, for many years, instituted a rigorous training program for our incoming designers in anticipation of the time when our weapons staff with test experience would no longer be available. Another important element to ensure the continuing reliability of the stockpile will be in maintaining two distinct design laboratories, where we have two separate teams; one at each lab, reviewing the annual data will ensure good overall confidence in our systems.

68. Senator CORNYN. Dr. Miller, how many weapon designers at Livermore will have direct nuclear test experience?

Dr. MILLER. There are presently 12 active nuclear weapons designers at LLNL with direct nuclear test experience. These designers continue to make vital contributions to maintaining the stockpile and assessing foreign threats. Additionally, there are a handful of LLNL managers with direct nuclear test experience who continue to share their expertise with the next generation of designers.

69. Senator CORNYN. Dr. Miller, what are the risks associated with the eventual condition when no weapon designers will have designed, tested, and deployed a new weapon?

Dr. MILLER. The SSP has been extraordinarily successful in developing the tool set required to maintain the stockpile in the absence of testing and using those tools to train the next generation of stockpile stewards. The program was specifically designed to maintain the skills necessary in the absence of nuclear testing. The SSP's above-ground experimental facilities, such as the NIF and DARHT, not only provide data required for stewardship, but also provide our weapons designers with opportunities to carry out complex, integrated physics experiments that stress and hone designer judgment as issues are investigated or potentially new phenomena are revealed. Additionally, judgment is developed through computational simulation. Detailed simulations of weapons system performance continue to give new insight into weapons physics, often times beyond that available during the era of underground nuclear testing.

Of equal importance is providing adequate opportunity to exercise skills in the complete design through production cycle, which is essential for training laboratory and production plant personnel. For example, the NNSA's assignment of responsibility for the W78 LEP to LLNL provides an essential path for maintaining the competency and capability of its design and engineering cadre through the exercise of an integrated system design/engineering/manufacturing program. Finally, involvement in the annual assessment process provides a basis for developing and exercising the judgment of new nuclear weapons staff in dealing with difficult issues related to nuclear design and engineering, in much the same way that the development of nuclear weapons and underground testing did.

The NNSA and the laboratories have made a concerted effort to mentor, train and validate the skills of the next generation of the Nation's stockpile stewards at a time when scientists and engineers, who were trained during the period of extensive weapon development programs and nuclear testing, are still available. I am confident in the capabilities and competencies of LLNL's workforce. Because of this, and the success of the SSP, I believe that the risks associated with the eventual condition when there are no weapon designers who have designed, tested, and deployed a new weapon are minimal.

70. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, the Strategic Posture Commission led by Secretaries Bill Perry and James Schlesinger recommended that DOE, NNSA, the Nuclear Regulatory Commission, and the DNFSB be realigned, and that NNSA should be a separate agency from the DOE. Has this occurred?

Dr. ANASTASIO. No. The Strategic Posture Commission recommendations, as outlined in Chapter 6, include the realignment of the DOE/NNSA, Nuclear Regulatory Commission and the DNFSB and the establishment of NNSA as a separate agency. Implementing these recommendations requires actions on the part of Congress in cooperation with the executive branch.

Dr. MILLER. Not to my knowledge.

Dr. HOMMERT. No, this has not occurred.

71. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, what efforts, if any, have NNSA and DOE taken to streamline Federal operations to facilitate laboratory productivity?

Dr. ANASTASIO. We continue to work with DOE and NNSA to seek improvements in process efficiency and to reduce and streamline Federal rules and regulations and their interpretation impacting laboratory operations and productivity to ensure the long-term vitality of the Laboratory. As the Strategic Posture Commission warned, NNSA has become part of the problem, "adopting the same micromanagement and unnecessary and obtrusive oversight that it was created to eliminate" As the Stimson Center recommended in its report (pg 41) Leveraging Science for Security A Strategy for the Nuclear Weapons Laboratories in the 21st Century "NNSA should configure its oversight of the Laboratories and NTS to ensure performance meets the national security priorities within the bounds of budget, policy, and law. The DOE should provide oversight in an audit capacity, not in a compliance capacity, to minimize unnecessarily intrusive and bureaucratic intervention."

Dr. MILLER. In December 2009, NNSA Administrator Tom D'Agostino launched an Enterprise Re-engineering Reform Initiative aimed at dramatically rethinking and redesigning what is widely perceived to be a compliance and enforcement-driven relationship between Federal and contractor entities in NNSA. The goal is transform to a more constructive Federal/contractor partnership using NNSA's effort with the Kansas City Plant (KCP) as a model.

LLNL submitted in June 2010 an Implementation Plan to the NNSA Livermore Site Office (LSO) for a governance approach implementing aspects of the KCP Oversight Model for Non-Nuclear Operations. Considerations included streamlining DOE orders and directives, implementation of a Management Assurance System, and changes to the Performance Evaluation Plan (used by NNSA to assess each site's performance) to focus it on more strategic issues.

Some progress is being made. The DOE Office of Health, Safety intends to streamline 107 directives. A LLNL/LSO Change Control Board has been chartered that will determine implementation of changes to DOE directives. In addition, our Laboratory has been taking significant steps to strengthen its Contractor Assurance System and transform it into a fully-functioning Management Assurance System that would serve as a means to eliminate Federal-contractor inefficiencies in management and controls and reduce fixed costs. We are not yet at a stage where the NNSA LSO has significantly modified oversight processes based on its use of our Contractor Assurance System.

Dr. HOMMERT. Since 2009, DOE, NNSA and Sandia have been working at DOE Secretary Steven Chu's direction to reengineer and transform the way DOE runs the enterprise and manages its contractors. Reform is necessary because the cost of doing business has outpaced the budget. Costs are being driven by management by directive, unclear Federal and contractor roles and responsibilities, and the government-owned contractor-operated (GOCO) contracting mechanism that needs updating.

To address the problems of overly prescriptive requirements that are open to inconsistent interpretation and application, NNSA and the contractors have focused reform on: (1) thorough reviews of all requirements by Federal/contractor boards; (2) use of voluntary consensus standards where they exist and are appropriate; (3) risk-based tailoring to each work situation; and (4) decisionmaking pushed to the lowest appropriate levels.

At all steps of this process, we are assuring that the referenced changes will enable continued improvement in our safety and security environments.

72. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, do you have extra layers of administration and expense because of the current management structure involving NNSA and DOE?

Dr. ANASTASIO. We have still not fully implemented the approach where the Federal Government establishes our goals and we find the most efficient and effective means of delivering those goals.

Dr. MILLER. Safe, secure, efficient, and environmentally responsible work performance is a top priority at LLNL. Our management structure and our systems reflect that priority and are designed to ensure that our work is performed safely and securely and meets environmental quality standards.

Many aspects of the way we operate are driven by DOE orders and directives-often requiring more manpower than is ideally necessary to ensure the quality of work performance. We are working with DOE and the NNSA to streamline applicable DOE orders and directives without compromising operational quality while implementing a Management Assurance System that can be used by the NNSA Livermore Site Office to modify and streamline oversight processes.

Dr. HOMMERT. We do have to meet administrative and management requirements at both the DOE and NNSA levels. For the most part, these requirements are specific to different components of the organization and are addressed accordingly. However, in my view, there is some level of redundancy.

73. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, the Strategic Posture Commission also recommended that laboratories be recognized for their involvement in the assessment of weapons in ways not involving an award fee. Has this recommendation been implemented? If so, how?

Dr. ANASTASIO. The Strategic Posture Commission recommended that Congress and the administration create a formal mechanism (not involving awarding fee) to recognize the importance of the involvement of the directors of the weapons laboratories in the annual certification process. I am not aware of any action to bring this recommendation to fruition.

Dr. MILLER. The Commission recommended creation of a formal mechanism "to recognize the importance of the involvement of the directors of the weapons laboratories." The Annual Assessment of the Stockpile is singularly my most important responsibility as director of LLNL. It is a responsibility that I—and prior directors—have taken on with full diligence and utmost seriousness.

To my knowledge, no direct action has been taken on the Commission's recommendation. However, the importance of my weapons assessment responsibilities

is properly recognized within the Federal Government. I have had access to all necessary audiences on any occasion where I have felt it necessary to voice a concern or issue about the stockpile. In addition, it is noteworthy that the fundamental importance to national security of independent, critical assessments of the condition of the Nation's nuclear stockpile by trained, knowledgeable experts at the NNSA laboratories was made clear in the 2010 NPR. This recognition is being supported by proposed necessary budget increases. Your continued support for the SSP is a highly valuable form of recognition of the importance of the work of the NNSA laboratories and their directors.

Dr. HOMMERT. The majority of Sandia's fee is fixed rather than award fee. While the award fee is associated with the overall laboratory performance, and some of the performance measures and milestones are associated with our stockpile evaluation and assessment responsibilities, in practice, I do not find any conflict between our fee structure and the ability to independently conduct the assessment of the stockpile. Going forward, I believe it is important to maintain our technical independence and that our technical judgment not be impacted by fee. Any changes to our fee structure should be carefully assessed to ensure appropriate incentives are established that do not compromise this technical independence.

74. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, do you worry about the management structure of the laboratories?

Dr. ANASTASIO. I do have concerns that in practice, the DOE/NNSA structure overseeing management of the Laboratory has room for improved efficiency and effectiveness, in balancing between enabling our support of technical work activities for our national security science missions (and which are aligned with the strategic views of both DOE and NNSA), and oversight of our operations. Related to this is the challenge of ensuring adequate investment in science, technology, and engineering capabilities and facilities that are essential to our mission, but extend beyond the near-term needs of the weapons program. This concern has also been identified in several previous external studies and assessments of the management and oversight structure under which the Laboratories function. Some studies, such as the report of the Congressional Commission on the Strategic Posture of the United States, have suggested profound restructuring. We continue to work with DOE and NNSA to seek improvements in process efficiency and to work with them and other agencies to ensure the long-term vitality of the Laboratory.

Dr. MILLER. Under the new contract and management structure, the Lawrence Livermore National Security, LLC (LLNS) partnership has assembled a prestigious Board of Governors consisting of leaders of the parent organizations and national experts in science and technology, mission, business, operations, and security. Oversight of Laboratory performance is maintained through a number of standing committees of the Board and regular corporate assessments. The Laboratory Director is also the President of LLNS and reports to this Board of Governors. The Federal Government through the LLNS Board of Governors has access to a broad range of commercial and academic expertise. The Board facilitates "reach back" to the parent organizations for augmenting the talent and expertise at the Laboratory when the need arises. Parent organizations have organized Assess, Improve, Modernize (AIM) Teams, and Functional Management Assessment (FMA) reviews are regularly scheduled throughout the year to help drive continuous improvement.

Over time, this has allowed the Laboratory to more cost effectively and efficiently fulfill its mission to provide exceptional science and technology to help solve the Nation's most important problems.

Dr. HOMMERT. I believe there is an effective management structure in place today. Within the construct of the GOCO model, further refinements and modernization are required to optimize our contributions to the broad set of national security challenges faced by our full customer set.

75. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, has there been a change in the emphasis on scientific research and academic freedom since the conversion to the for-profit model?

Dr. ANASTASIO. Our emphasis on scientific research and academic freedom has not changed-it is critical to our mission. Los Alamos' national security mission, and its role as the premier national security science laboratory, requires a strong emphasis on scientific research. We continue to lead the national laboratories in the number of peer-reviewed scientific publications, we continue to win a significant number of R&D 100 awards each year, and our staff continues to be recognized by professional societies for their work. Our annual external reviews of our technical capabilities also help us validate our strengths and identify any weaknesses. Our mission requires that we act first and foremost in the best interests of the Nation, and rep-

resent our best technical judgments with integrity and objectivity. Our internal policies therefore continue to protect academic freedom to publish, and to demand intellectual integrity and expect scientific objectivity even in the face of possibly competing interests. Without scientific integrity, we would fail both ourselves and the Nation.

Dr. MILLER. In my view, the importance of scientific research and academic freedom has not been impacted by the change in the organization that manages the Laboratory for the Federal Government. These remain important cores values of the institution. I highlighted in my written testimony some of the many outstanding scientific and technical accomplishment made at LLNL in fiscal year 2010. The Lawrence Livermore National Security (LLNS) Board of Governors shares my belief that the Laboratory's continuing success ultimately depends on the strength of its science, technology, and engineering, which in turn, depends on the quality of people at the Laboratory and their ability to pursue scientific research in the national interest.

As I also stressed in my written testimony, the national investment in the impressive science, technology, and engineering capabilities at the NNSA laboratories needs to be carefully nurtured and preserved. My concerns are budgetary. If these assets are neglected, they will quickly erode and disappear. This issue merits your careful consideration as the country faces both very difficult budget decisions and a challenging future in a dangerous world.

Dr. HOMMERT. Please see my response to QFR #73.

76. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, do you worry about the independence of the laboratories now and in the future?

Dr. ANASTASIO. The Laboratories remain independent today and must in the future, to continue to properly serve the Nation. As I noted in my answer to the previous question, our mission requires both a strong emphasis on science and to provide out best technical judgments with integrity and objectivity independent of possibly competing interests. Los Alamos maintains that independence today-from both political and commercial interests. I have no concern that this is changing, today. Among other things, the presence of the University of California among the parent companies in Los Alamos National Security, LLC helps support that historical—and vital—tradition. However, retaining this independence requires vigilance. It is important that future Congresses and administrations recognize the importance to the Nation of the independence of the Laboratories and help the Laboratory guard it, for it is certainly possible for future decisions on management and structure to undermine it.

Dr. MILLER. I do worry about the continuing independence of the NNSA laboratories in the future because it is an essential element and core strength of the Laboratory—not only for our assessments of the safety, security, and performance of the nuclear weapons stockpile and certification of changes made to weapons to extend their lifetime, but also to ensure the quality of the other vitally important national security work we perform.

Our continuing independence depends on three key factors. First is continuing recognition by the executive branch and Congress of the importance of the laboratories and their independence. Second, funding for the laboratories over the long term must be sufficient for them to sustain the scientific skills and technical know-how required to competently deal with challenging nuclear weapons issues and merit the confidence of the American people in the judgments of our stockpile stewards. Finally, the NNSA national laboratories must continue to attract and retain top-notch talent to address the major scientific and technical challenges of stockpile stewardship and the many national security issues facing the U.S. Vigilance is required in each of these areas to sustain laboratory independence.

Dr. HOMMERT. It is important that the laboratories live up to the principles of the FFRDC model by "operating in the public interest with objectivity and independence and to be free from organizational conflicts of interest". In my view, this model needs to be continually reinforced and while I believe the national laboratories continue to render effective independent advice to the government; constant vigilance is required to retain this independence.

77. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, is the Federally Funded Research and Development Center (FFRDC) model intact at the NNSA laboratories? If not, what has changed?

Dr. ANASTASIO. Under the Federal Acquisition Regulations, an FFRDC "meets some special long term research or development need which cannot be met as effectively by existing in-house or contractor resources" and "is required to operate in the public interest with objectivity and independence." The Laboratories are

exemplars for both attributes. The FFRDC model is excellent. However, I am concerned that our current contractual environment has led to an overemphasis on managing the Laboratory as a procurement contract and that this constrains the implementation of the FFRDC model at the Laboratories, and limits the efficiency and effectiveness with which we can offer support to Federal agencies in the way that the FFRDC model intends.

Dr. MILLER. LLNL is a FFRDC, operated as a GOCO entity. The paradigm for GOCO model is that the Government tells the contractor "what to do," and the contractor determines "how to do it."

The GOCO model needs attention. The DOE Secretary, the Deputy Secretary and the Under Secretaries have made it a high priority to improve the efficiency of the Departmental processes and mechanisms for governance. In December 2009, NNSA launched an Enterprise Re-engineering Reform Initiative aimed at dramatically rethinking and redesigning what is widely perceived to be a compliance and enforcement-driven relationship between Federal and contractor entities in NNSA. We are working with NNSA to identify governance/oversight issues and address them with the goal of transforming to a more constructive Federal/contractor partnership.

Dr. HOMMERT. For the most part, the FFRDC model is intact at the NNSA laboratories. However, these laboratories are much more diverse in their national security roles than when the FFRDC model was first created. There is an interplay between the GOCO and FFRDC models that can impact the ability of the laboratories to fulfill their FFRDC roles. For these reasons, I believe a re-examination of the model is appropriate.

78. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, what is the role of the national laboratories in doing deterrence analysis, targeting analysis, model development, analysis validation, etc.?

Dr. ANASTASIO. The nuclear weapons laboratories bring critical technical capabilities to bear on numerous national security problems. While the core mission of Los Alamos is assuring the safety, security, and effectiveness of the U.S. stockpile, the skills and personnel required for this mission also contribute to addressing other national challenges. The Laboratory was heavily involved in Cold War deterrence modeling and analysis, as well as in assessing weapon effects. Today, we are working on deterrence, stability and other related national security issues. Los Alamos is also involved in providing detailed analysis on nuclear nonproliferation, counter-proliferation, foreign weapon intelligence, and event response capabilities. Much of this work performed at Los Alamos involves and/or benefits from the development of applicable models to help inform decisions. Wherever possible, validation tools are also used to increase confidence in the robustness of such analyses.

Dr. MILLER. LLNL personnel have supported decisionmaking at the highest levels of government since the establishment of the Laboratory. LLNL has played a significant support role by providing in-depth technical analysis across the full spectrum of the Nation's 'Strategic Assessment' efforts.

Generally, a strategic assessment capability consists of three broad areas of capabilities:

(1) Deterrence Theory. This includes its translation into nuclear policy and doctrine. This effort draws on the intellects of our most experienced academics, former and current senior policy advisors, and former and current senior military officers. Over the years, the national effort has been informed by studies conducted at LLNL on the impact of systems and technologies that might be deployed in the future.

(2) Decisionmaking. Background and context support of the necessary government decisions is required to turn nuclear policy guidance into practical implementation plans. This is the area where LLNL's history of integrating science, technology and engineering has fundamentally contributed to the assessment of U.S. and foreign nuclear weapons systems and capabilities-as well as the impact of potential and proposed arms control agreements. Three examples are ICBM basing analysis, studies of strategic stability with the deployment of ballistic missile defenses, and the analysis of modernization of tactical nuclear forces in Europe.

(3) Development of execution plans for our nuclear forces. This is comprised of direct support to the Nation's nuclear warfighting apparatus and involves a myriad of technical analyses. We serve in technical advisory roles for such systems as the STRATCOM's S&T Advisory group, Red on Blue type exchange studies, and technical issue reviews associated with targeting studies such as "hard and deeply buried targets."

Dr. HOMMERT. The 1953 Agreement between the AEC and DOD directs the laboratories to perform analyses of weapons effects, target interactions, and weapon options. The nuclear weapons laboratories have a long history of performing these analyses, often in partnership with the DOD. DOD has the lead in weapons effects/target interaction analysis methodology while the national laboratories are primarily responsible for weapons performance and output modeling.

79. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, what is the status of these capabilities at the laboratories?

Dr. ANASTASIO. Los Alamos prides itself on being a national resource, where as a trusted advisor for the government, we provide technical input and support on a variety of key national security issues. As a result of our broad mission space, our national security scientific capabilities have grown and strengthened over the past several years to new levels (e.g., nonproliferation and counterterrorism). Unfortunately, other critical areas have experienced significant atrophy, resulting in areas where we are manpower and/or resource limited (e.g., radiochemical analysis and assessment, and weapon targeting and effects analyses). For now, I remain confident that we are able to deliver on the missions we are asked to address today, but I am concerned about the future for some of these critical programs.

Dr. MILLER. Today, the strategic assessment capability that exists at the Laboratory is significantly less than the capabilities we had at the height of the Cold War and what continued to exist up through the early 2000s. Some of this reduction had begun, understandingly, with the demise of the Soviet Union and the halt in the development of new nuclear weapons systems. The remaining reductions were a direct result of a combination of circumstances: (1) budgetary pressures on the nuclear enterprise such that the Laboratory could no longer continue this mission-supportive effort as a funded priority; (2) the lack of a government agency willing to sponsor and sustain the special skill base required for these types of analyses; and (3) the attrition of the high caliber, experienced individuals able to lead these types of specialized assessments without any replacement planning.

While LLNL has a number of very talented individuals who can do technical analyses, we will have to "grow" the necessary skill sets of these individuals. They would provide leadership in LLNL's efforts to rebuild the Nation's efforts in this critical area. Essentially, if we are to develop such a sustainable, focused capability in a short amount of time, we would need to "mentor" a few handpicked individuals drawing on those experienced strategic systems analysts at LLNL who have led previous efforts and are either semi-retired but still available or about to retire in the next few years. This would require a concerted effort that must be planned and executed before the opportunity vanishes.

It is important to note that this is a widely prevalent situation for the Nation's Strategic Assessment Capability, and that high-quality analyses require an interconnected network of skill sets. The nation would need a multi-year commitment from DOD and the NNSA to restore a sustainable Strategic Assessment Capability and a coordinated, interagency plan on what to specifically refresh, restore, and/or refocus.

Dr. HOMMERT. At Sandia, these capabilities are strong. We have maintained a core group of systems analysts who have the appropriate clearances, access to data, and the broad understanding of nuclear weapons, weapons effects, target response, and military operations required for such assessments. The weapons modeling activity is a core activity for the laboratories and has been strongly supported. Sandia's recent focus in these efforts has been on supporting both DOD and NNSA decisions regarding LEPs, and on maintaining nuclear deterrence with the smallest possible number of weapons.

80. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, how have those capabilities been enhanced or decreased over the last 20 years?

Dr. ANASTASIO. As I mentioned in my previous answer, Los Alamos has had some capabilities increase over the past 20 years, while others have atrophied. Some of our enhanced capabilities include the advancement of simulation, modeling, and computational capabilities, improved validation supporting not only the weapons program, but also nuclear nonproliferation, counter-proliferation, foreign weapon intelligence and event response capabilities. One area where skills have atrophied includes the tri-laboratory (LANL, LLNL, SNL) efforts on targeting analysis and weapon effects modeling. The current expertise in these areas resides mainly in increasingly senior staff, whose skills are not exercised regularly and whose capabilities must be transferred to create the next generation of experts.

Dr. MILLER. Despite the need to deal with a number of new technologies and innovations in the strategic area that have strong implications for our national security,

there has been little government agency interest in conducting the type of rigorous analytical assessments that have supported decisionmaking in the past. This atrophy in capability began with the collapse of the Soviet Union and the subsequent peace dividend and was followed by a shift of the Nation's focus to conventional wars and countering terrorism. In terms of our remaining capabilities, it would be fair to say that current capability is largely aimed at support for the warfighter and the development of nuclear force execution plans.

A major concern I have—in addition to the erosion and potential loss of our Strategic Assessment Capability—is the fact that we are not developing and applying necessary assessment capabilities to address the new realities we are beginning to face today from technical innovations and potential threats that are lurking just over the horizon. For example, we have limited ability to do assessments that incorporate advanced conventional capabilities, cyber, space warfare, hypersonic and boost glide delivery technologies, and advances in stealth and directed energy weapons.

Dr. HOMMERT. In the area of weapons modeling, Sandia's capabilities have been substantially enhanced over the past 20 years. The Science-Based SSP strengthened our ability to predict weapon system behavior in a variety of environments. This has increased our confidence in assessments of the reliability of the stockpile. In the deterrence and targeting analysis areas, Sandia's capabilities are longstanding and have been enhanced in the last 20 years by the close interaction and relationships established with the organizations responsible for building the Nation's war plans (e.g., STRATCOM, JFCC Global Strike, OSD, DIA, and the military services).

81. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, is there appropriate expertise to assess a potential major shift in U.S. nuclear weapon policy?

Dr. ANASTASIO. There is a small core group of dedicated individuals at Los Alamos with a broad range of experience involving issues related to nuclear weapons policy. In 2009 and 2010, this core group provided technical guidance on, and input into, the development of the government's policy positions for the 2010 NPR, the NPT Review Conference, the Nuclear Security Summit, and the New START treaty. Often on short timelines, this team helped engage the broader scientific capabilities of the laboratory to provide direct assistance to the administration on the technical issues involved in these important events and documents, helping to enable informed decisions that affect the future of U.S. nuclear weapons, nonproliferation and arms control policies.

Dr. MILLER. Assessing a major shift in U.S. nuclear weapons policy is a very complex undertaking requiring an integrated set of analytical skills that includes policy, sociological, and technical expertise. LLNL has participated in studies of this character in the past, but recent experiences and current capabilities are limited. The strategic assessment capability that exists at LLNL is significantly less than the capabilities we had at the height of the Cold War and what continued to exist up through the early 2000s.

LLNL has a number of very talented individuals who can do technical analyses, but we will have to "grow" the necessary skill sets of the individuals at the Laboratory that would provide leadership in our efforts to support the Nation's efforts to carry out such an assessment. Most importantly, an integrated set of analysis capabilities—here at the Laboratory or elsewhere—largely does not currently exist and would have to be rebuilt. However, key pieces exist at LLNL. We can build on technical expertise and capabilities in areas such as weapons reliability and effectiveness, weapons enterprise production capabilities, issues related to monitoring nuclear weapons and their production, technologies and challenges related to verification, emerging strategic technologies and threats, and the capabilities of other nation states.

Dr. HOMMERT. The appropriate expertise does exist to both assess the pros and cons of various policy options, as well as assess the detailed implications of any given policy. Close interaction and coordination among the major stakeholders mentioned previously is required. Sandia's contributions stem primarily from our broad understanding of nuclear weapons and possible future stockpile scenarios, including implications for deterrence policy and the nonproliferation and arms control regime.

82. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, what additional measures are needed?

Dr. ANASTASIO. As the Nation continues to rely on a safe, secure, and effective nuclear deterrent for its security and that of its allies, the national nuclear laboratories play a critical role.

Included in this role is providing technical support to policy makers. One of the concerns at the national laboratories is that the set of individuals, which hold both

in-depth technical and policy capabilities in nuclear weapon policy, is small in number and getting older. One of our goals in the coming years will be to engage more young laboratory staff in technical/policy issues involved in sustaining an effective deterrent, while also addressing broader national security issues including nonproliferation and arms control—and to help these staff develop the experience needed to support future policy discussions and decisionmaking. Their informed technical input will be critical for the future, especially as it relates to the U.S. nuclear weapons stockpile and enterprise, and to the development and effective implementation of nonproliferation, nuclear security, counterterrorism and arms control monitoring and verification capabilities.

Dr. MILLER. The experienced, skilled analysts and integrated set of analysis capabilities needed to carry out a thorough assessment of a major shift in U.S. nuclear weapons policy largely does not exist—at LLNL or elsewhere—and would have to be rebuilt. The nation would need a multi-year commitment from DOD and the NNSA to restore a sustainable Strategic Assessment Capability and a coordinated, interagency plan on what to specifically refresh, restore, or refocus.

Rebuilding a Strategic Assessment Capability is also important for addressing the new realities we are beginning to face today from technical innovations and potential threats that are lurking just over the horizon. For example, the Nation currently has limited ability to do assessments that incorporate advanced conventional capabilities, cyber, space warfare, hypersonic and boost glide delivery technologies, and advances in stealth and directed energy weapons.

Dr. HOMMERT. It will be important for the United States to develop a better understanding of future adversaries to maintain deterrence at lower stockpile numbers while simultaneously strengthening global non-proliferation construct. This can be accomplished by more regular and robust interagency collaborations that seek to cost-effectively enhance analytic capabilities. In addition, we need a stronger emphasis on assessments of aging and technology obsolescence as we move forward with the modernization of the stockpile.

83. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, how would you rate expertise in nuclear weapons effects analysis?

Dr. ANASTASIO. Los Alamos has expert-level capability in certain areas, and a lesser level of expertise in other areas. While the number of staff with these skills are limited, expert-level capabilities exist in definition of the weapons-effect source term (all radiation outputs emanating from a nuclear explosion); in the transport of radiation (e.g., neutrons, gamma-rays, x-rays) and the radioactivity levels they induce; in nuclear forensics; in electromagnetic pulse assessment; in air-shock and ground-shock environments; in certain nuclear-explosion space environments; and in assessment of nuclear weapon effects on U.S. warheads. Los Alamos has some expertise on modeling radiation plume dispersal; thermal-pulse environments; and structural damage.

Dr. MILLER. I believe that the integrated set of capabilities to perform weapons effects analysis has degraded significantly. Today, the skill to perform weapons effects analysis resides in a mere handful of people. At LLNL, we continue to be mindful of the importance of maintaining the expertise in this essential analysis area within the context of limited resources.

However, it is important to note that with the tools developed by the SSP, the ability of the community to significantly advance our understanding of nuclear weapons effects has greatly increased. HPC advances make it possible to develop and apply far more detailed simulations of weapons effects than were possible even a decade ago. Tools like the NIF have enormous potential to conduct weapons effects tests and to gather detailed data that can be used to validate simulation models. In fact, the first campaign of weapons effects experiments was performed in 2010. A cadre of critically skilled weapons scientists and engineers is available to execute the task rebuilding weapons effects analysis capabilities.

Dr. HOMMERT. Our nuclear deterrence depends on the capability of our stockpile to hold an adversary's assets at risk. To guarantee this, nuclear weapons must be designed and built to withstand extreme levels of radiation and still function as intended. The laboratories must have a deep scientific understanding of how radiation can damage systems and be able to model the effects of radiation on our stockpile. We can no longer do the testing that was done at the Nevada Test Site or at other facilities that are no longer operating, such as the Sandia Pulsed Reactor. We are more dependent than ever on our remaining experimental facilities and our ability to model effects.

Our expertise in modeling weapons effects is extensive but fragile. This capability depends on scientific expertise in a wide range of esoteric subjects, such as electromagnetic effects, shock and mechanical response, equation of state of exotic mate-

rials, radiation transport, radiation damage in semiconductors, high-voltage breakdown, nuclear and plasma diagnostics, pulsed-power and reactor technologies, density functional theory, and molecular dynamics. In some areas our expertise is very robust, but in other areas it depends on just one or two people. In a couple of cases we have lost important capability, and we are trying to rebuild it. Many of our best scientists are nearing retirement, and we are aggressively recruiting people to work on the upcoming stockpile refurbishments. It takes some time for newly hired staff to become fully effective in working on our unique technologies. We face significant technical challenges in understanding the performance of aging weapons and in refurbishing the stockpile. Our research programs in these areas are essential to supporting the stockpile and to training the staff of the future.

84. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, in terms of the connection between stockpile stewardship and assessing the targeting value of a weapon, what are the consequences of warhead aging and reliability for STRATCOM on targeting, especially at reduced stockpile numbers?

Dr. ANASTASIO. Intended weapon targeting is factored into the Military Characteristics and Stockpile-to-Target sequence requirements associated with each type of U.S. weapon system. Weapons must sustain the rigors of warhead launch and delivery, and may be intended to fly through and survive defended target space (so-called hostile encounters). In general, nuclear weapons were designed with margins to sustain the rigors of warhead delivery, including hostile encounters. Weapon aging can lead to internal weapon changes that reduce those margins, which, in principle, can impact STRATCOM targeting options. Los Alamos has the capability to assess the impact of weapon aging, as well as the rigors of warhead delivery and hostile encounters, in evaluating reduced weapon margins. Accordingly, inputs are made available to STRATCOM to help inform their decisions on targeting. These inputs become more important at reduced stockpile numbers and as the stockpile continues to age.

Dr. MILLER. As the number of weapons decrease, the importance of optimal selection of targets and reliable weapon performance greatly increases. At some point, a fundamental shift in approach will be necessary. During the Cold War, with large numbers of weapons and targets, consideration of a statistical average of expected weapon reliability was sufficient and if a target were especially important, more than one weapon could be designated. At much smaller numbers, knowledge of the health of each individual warhead becomes increasingly important. Such information will require a fundamental change in the nature of the surveillance stockpile program and use of technical options such as imbedded sensors that would allow assessment on a weapon-by-weapon basis rather than reliance on statistical "average" behavior.

Dr. HOMMERT. Today, the U.S. nuclear weapons stockpile is assessed to be safe, secure, and reliable. We strive to continuously strengthen the scientific underpinnings of our assessments, and thereby improve our understanding of the state of health of the stockpile. For the future, concerns we have about aging and technology obsolescence associated with our non-nuclear components must be addressed through the LEPs.

85. Senator CORNYN. Dr. Anastasio, Dr. Miller, and Dr. Hommert, should there be consideration given to increased reliability/survivability requirements as the stockpile is reduced?

Dr. ANASTASIO. Consideration for stockpile reliability and survivability requirements is extremely high today, and would remain so as the stockpile is reduced.

Dr. MILLER. It is important to ensure the reliability of stockpile remains high as the stockpile is reduced. It is equally important that the Nation have high confidence in the quality of the weapon performance and reliability assessments of the stockpile stewards. A balanced and well-funded SSP is key to ensuring the stockpile is safe, secure, reliable, and effectively meets evolving military requirements and assuring decisionmakers that the weapons scientists and engineers making those assessments have the necessary training, skills, and ability.

The fiscal year 2011 budget increase is a positive first step toward reversing the recent declining budget trends and revitalizing the nuclear weapons complex necessary to maintain the U.S. nuclear deterrent. The necessary program of work to create a balanced SSP includes: (1) the science and technology that underpins our understanding of an aging stockpile and supports a reinvigorated surveillance program; (2) the LEPs that are necessary to keep the systems safe, secure and effective; and (3) the modernization of the facilities and infrastructure. Funding shortfalls in any one of the three primary areas of SSP will affect the deterrent, particularly as the stockpile is reduced.

Dr. HOMMERT. The requirements for stockpile reliability and survivability are high today, and should be maintained as the size of the stockpile is reduced. As we go forward to reduced numbers, we must address aging and technology obsolescence associated with non nuclear components to ensure that our stockpile continues to meet these requirements.

[Whereupon, at 4:20 p.m., the subcommittee adjourned.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 2012 AND THE FUTURE YEARS DEFENSE PROGRAM

WEDNESDAY, APRIL 6, 2011

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

STRATEGIC SYSTEMS

The subcommittee met, pursuant to notice, at 2:32 p.m. in room SR–232A, Russell Senate Office Building, Senator E. Benjamin Nelson (chairman of the subcommittee) presiding.

Committee members present: Senators Nelson and Sessions.

Majority staff member present: Madelyn R. Creedon, counsel.

Minority staff member present: Daniel A. Lerner, professional staff member.

Staff assistants present: Christine G. Lang, Hannah I. Lloyd, and Brian F. Sebold.

Committee members' assistants present: Ann Premer, assistant to Senator Nelson; and Lenwood Landrum, assistant to Senator Sessions.

OPENING STATEMENT OF SENATOR E. BENJAMIN NELSON, CHAIRMAN

Senator NELSON. Good afternoon. The Strategic Forces Subcommittee convenes today to discuss the strategic systems of the Military Services, the bombers, the submarine-launched ballistic missiles (SLBM), and the land-based ballistic missiles. They'll all be in the inventory of U.S. strategic systems for many years, but in smaller numbers. At the same time that we're reducing the overall numbers of strategic systems, we must also be modernizing them. Most of these systems will support U.S. deterrence through 2030.

To discuss these systems today, we have with us: Lieutenant General James M. Kowalski, Commander, Air Force Global Strike Command; Rear Admiral Terry J. Benedict, Director, Navy Strategic Systems Programs (SSP); Major General David J. Scott, Director, Air Force Operational Capability Requirements, Deputy Chief of Staff, Force Operations, Plans and Requirements; Major General William A. Chambers, Air Force Assistant Chief of Staff for Strategic Deterrence and Nuclear Integration; and Brigadier

General Garrett Harencak, Commander, Air Force Nuclear Weapons Center.

Welcome to all of you here today. We appreciate your being here.

At approximately 3:30 p.m., we'll adjourn here and reconvene in a closed session in room 217 of the Senate Visitors Center. Lieutenant General Mark D. Shackelford, Military Deputy, Office of the assistant Secretary of the Air Force for Acquisition, will brief the members of the committee on the Air Force plans for the new bomber program.

Last year the administration completed the congressionally-directed Nuclear Posture Review (NPR), which set forth the nuclear force structure for the next decade. This force structure is reflected in the New Strategic Arms Reduction Treaty (START) which entered into force in February. Under the terms of the treaty, the United States will maintain no more than 700 deployed strategic missiles and nuclear-capable bombers and no more than 800 non-deployed strategic missile launchers and nuclear-capable bombers. While the United States has 7 years to come into compliance with the treaty, planning is already underway.

We look forward to hearing from each of our witnesses this afternoon about the plans for implementing the New START treaty. While reducing the number of delivery systems, they must also be sustained, modernized, and eventually replaced. Each of the systems today is highly capable, but maintaining that capability well into the next decade will take significant focus and funding.

All three of the bombers will need significant modernization until the new bomber can replace them. The B–52, the oldest of the bomber fleet, will be almost 70 years old when it's replaced. While old, the bombers remain formidable, as evidenced by recent events in Libya and the ongoing deployments in support of the war in Afghanistan.

The Trident D5 SLBM will continue in production, with targeted upgrades, as it transitions from the current ballistic missile to the *Ohio*-class replacement submarine. Planning and design for that new submarine is already underway.

The Minuteman III intercontinental ballistic missile (ICBM) has recently been upgraded to last through 2020. To continue to be a viable system through 2030, updates will be needed.

While most of the attention is focused on the delivery systems, the infrastructure that sustains these systems is fragile and must also be maintained and modernized. The support, test, and training equipment, the command and control systems, and even the helicopters that provide access to the missile fields must all be updated or replaced.

Since the events of August 2007, when the Air Force unknowingly flew nuclear weapons on the wings of a B–52 bomber from Minot Air Force Base to Barksdale Air Force Base, the Air Force has undertaken significant changes in its management, organization, and support of the nuclear enterprise. The positions that Lieutenant General Kowalski, Major General Chambers, and Brigadier General Harencak now hold were all established as the result of that mistake. The Air Force has made considerable progress in an effort to ensure that its nuclear enterprise is sound.

We look forward to hearing from each of you about the changes that have been made, the progress that has been achieved, and the plans to ensure that the progress is sustained.

Now it's my pleasure to turn to the attention of Senator Sessions, my good friend and ranking member, for any opening comments you may have.

STATEMENT OF SENATOR JEFF SESSIONS

Senator SESSIONS. Thank you, Mr. Chairman. I just so much enjoy working with you and respect you and your knowledge of these issues and commitment to America, to the defense of our country. I know you deeply share those views.

I thank the distinguished panel for being with us and your service to your country. Given that appropriate policy officials couldn't be here today, I appreciate, Mr. Chairman, your commitment to hold another committee hearing next month to address critical issues regarding the modernization and future plans for further potential reductions, and I'm afraid unwise, reductions in the size of our nuclear stockpile with the U.S. Strategic Command (STRATCOM) and Department of Defense (DOD) policy officials.

Last week's hearing focused on the cost for modernizing the nuclear weapons complex. The effort is a critical recapitalization program which the administration estimates will cost at least $84 billion over 10 years.

I came up, Mr. Chairman, and I asked about those two buildings. They would cost a lot of money. We just had the biggest industrial, I think, announcement in America in Alabama, Thyssenkrupp steel mill, $5 billion, 3,700 acres, 7 million square feet under roof, 160 acres under roof, 11 million cubic yards of Earth moved, twice that for Hoover Dam; 75,000 pilings laid end to end would stretch from Mobile, AL to Houston, TX; 1 million cubic yards of concrete, and much more. That was including their equipment, a $5 billion project.

I think our two buildings that they're talking about were $4 or $5 billion each, and I think we need to ask about the cost of those buildings as we go forward. We need them, though. I really do believe that there's no alternative to modernizing our infrastructure at our labs.

Today's hearing focuses on the triad of nuclear delivery vehicles and its modernization, which is estimated to cost more than $120 billion over that same period. In sum, for the foreseeable future our country must commit itself to approximately $20 billion a year to sustain and modernize our strategic deterrent. This, I think, is necessary investment. If we can make it successful for less, we need to try to do that. But we just have to assume this, because we neglected real investments in this area for many years.

I fully agree with the bipartisan Perry-Schlesinger Strategic Posture Commission finding that: "The triad of strategic nuclear delivery systems should be maintained for the immediate future and this will require some difficult investment choices." I think that bipartisan commission is correct. Characterizing the choices before us as "difficult" might be an understatement, but one thing that is absolutely clear is that the recapitalization of our deterrent will re-

quire a sustained, smart, and long-term commitment spanning future Congresses and administrations.

I look forward to discussing the overall importance and crucial need for this modernization effort. I also look forward to discussing the timeline during which these modernization efforts must be accomplished, our ability to sustain what we currently have, and the steps being taken early on in emphasizing the affordability of the systems.

DOD unfortunately is not immune to the current fiscal situation that we find ourselves in. This year we'll spend $3.7 trillion and we take in $2.2 trillion. Admiral Mullen, the Chairman of the Joint Chiefs of Staff, has told us that our biggest national security threat is our debt.

Everybody will be challenged, but there are certain things we have to have. We have to have a triad. We have to have nuclear deterrence and it needs to be safe and reliable. A robust triad of nuclear delivery vehicles is essential and the recapitalization is critical to national security.

One of the biggest unanswered questions in the future is the ICBM force. According to section 1251 of the report's November 2010 update, the administration intends to begin to study what a follow-on ICBM might look like, but it is doing so with the concerning caveat, we note. That is, in a way that "supports continued reductions in the U.S. nuclear weapons."

Recent statements by the President's National Security Adviser have shed new light on the administration's intention. In his speech before the Carnegie Endowment, Mr. Donilon stated "The administration is currently making preparations for the next round of reductions"—we've hardly gotten through this one, or approved this one, and that DOD will "review our strategic requirements and develop our options for further reductions in our current nuclear stockpile." He continued to mention in that speech the, as he said, the President's declared vision for "achieving peace and security in a world without nuclear weapons." I'm confident that I won't live to see that, unless we do have a second coming.

Mr. Donilan continued by stating that in meeting these objectives the White House will direct DOD to consider "potential changes in targeting requirements and alert postures."

Last month, along with 40 of my colleagues, I sent a letter to the President regarding our desire to be consulted on any further reduction plans to the nuclear stockpile. The New START treaty was only signed a few weeks ago. Yet the administration is moving forward in my opinion in a pace that justifies the phrase "reckless," pursuing more reductions at an expedited and potentially destabilizing pace.

I am very concerned and I look forward to discussing with our witnesses today what guidance and assumptions they have been given or told to follow in the design, development, and posture for modernizing the triad, and we'll have the policy people to discuss at a later date.

Thank you, Mr. Chairman, for having this hearing and for the excellent team of witnesses we have before us.

Senator NELSON. Thank you, Senator Sessions. I appreciate very much your opening comments and look forward to the opportunity for questioning.

We have a large panel this afternoon and limited time. All of the prepared statements will be included for the record. It's my understanding that Lieutenant General Kowalski, Rear Admiral Benedict, and Major General Chambers will be making the opening statements. I guess we should start with you, Admiral.

STATEMENT OF RADM TERRY J. BENEDICT, USN, DIRECTOR OF STRATEGIC SYSTEMS PROGRAM, U.S. NAVY

Admiral BENEDICT. Chairman Nelson, Ranking Member Sessions, distinguished members of the subcommittee: It is an honor to testify before you today representing SSP. SSP's mission is to design, develop, produce, support, and protect our Nation's sea-based strategic deterrent, the Trident II D5 strategic weapon system.

The recently ratified New START treaty increases the dependence on the submarine leg of the triad. The reductions in warheads and launchers will result in ballistic missile submarines carrying approximately 70 percent of the Nation's strategic commitment.

I have focused on four priorities since returning to SSP: nuclear weapons security, the D5 life extension program (LEP), the *Ohio* replacement program, and the solid rocket motor industrial base. The first priority I would like to address and arguably the most important priority is the safety and the security of the Navy's nuclear weapons. Our Marines and Navy Master-at-Arms provide an effective and integrated elite security force at our two Strategic Weapons Facilities, in King's Bay, GA, and Bangor, WA. U.S. Coast Guard units have been commissioned at both facilities to protect our *Ohio*-class submarines as they transit to and from their dive points.

The second priority I would like to discuss is SSP's life extension efforts to ensure an effective and reliable sea-based deterrent. The D5 weapon system continues to demonstrate itself as a credible deterrent and exceeds the operational requirements established for the system almost 30 years ago. Last month the USS *Nevada* conducted the 135th consecutive successful flight of the D5 system.

SSP is extending the life of the D5 weapon system through an update to all the subsystems: launcher, navigation, fire control, guidance, missile, and reentry. These life extension efforts will provide the Navy with the system we need to meet the operational requirements.

My next priority and one of the highest Navy priorities is the *Ohio* Replacement Program. To lower development costs and leverage the proven reliability of the Trident II D5, the *Ohio* replacement SSBN will enter service with the D5 strategic weapon system beginning in 2029.

Finally, I would like to discuss the importance of the solid rocket motor industrial base. The Navy is maintaining a continuous production of rocket motors. However, we have faced significant cost challenges as both the National Aeronautics and Space Administration (NASA) and the Air Force demands have declined. We are working with our industry partners, DOD, and Congress to sustain

the solid rocket motor industrial base and find ways to maintain successful partnerships.

Thank you for the opportunity to testify today and at the end of the other two opening statements I would be pleased to take your questions, sir.

[The prepared statement of Admiral Benedict follows:]

PREPARED STATEMENT BY RADM TERRY BENEDICT, USN

INTRODUCTION

Chairman Nelson, Senator Sessions, distinguished members of the subcommittee, thank you for this opportunity to discuss Navy's strategic programs. It is an honor to testify before you this morning representing the Navy's Strategic Systems Programs (SSP).

SSP's mission is to design, develop, produce, support and protect our Navy's sea-based strategic deterrent, the Trident II (D5) Strategic Weapon System (SWS). The Trident II (D5) Submarine Launched Ballistic Missile (SLBM) represents the Nation's most survivable strategic deterrent capability. The men and women of SSP and our industry partners remain dedicated to supporting the mission of our Sailors on strategic deterrent patrol and our Marines and Sailors who are standing the watch ensuring the security of the weapons we are entrusted with by this nation.

It has been 11 months since I assumed command as the 13th Director of SSP. This is a relatively small number of incumbents since the inception of the program 55 years ago. Since returning to SSP, I have focused on four priorities: Nuclear Weapons Security; the Trident II (D5) SWS Life Extension Program; the *Ohio* Replacement Program; and the Solid Rocket Motor Industrial Base. Today, I would like to discuss my four priorities and why these priorities are keys to the sustainment of the Navy's sea-based strategic deterrent and its future viability. I will also provide an update on our SSBN force and our flight test program.

NUCLEAR WEAPONS SECURITY

The first priority I would like to address, and arguably the most important priority, is the safety and security of the Navy's nuclear weapons. Navy leadership has clearly delegated and defined SSP's role as the program manager and technical authority for the Navy's nuclear weapons and nuclear weapons security in Secretary of the Navy (SECNAV) Instruction 8120.1.

At its most basic level, this priority is the physical security of one of our Nation's most valuable assets. Our Marines and Navy Masters at Arms provide an effective and integrated elite security force at our two Strategic Weapons Facilities in Kings Bay, GA, and Bangor, WA. U.S. Coast Guard Maritime Force Protection Units have been commissioned at both facilities to protect our submarines as they transit to and from their dive points. These coast guardsmen and the Navy vessels they man provide a security umbrella for our *Ohio*-class submarines. Together, the Navy, Marine Corps and Coast Guard team form the foundation of our Nuclear Weapons Security Program.

SSP's efforts to sustain the safety and improve the security of these national assets continue at all levels of the organization. On October 1, I stood up a new division within SSP responsible for overseeing all nuclear safety and security operations, as well as managing the future acquisition planning for this mission. SSP continues to maintain a safe, reliable, and secure environment for our strategic assets as well as focus on the custody and accountability of the nuclear assets that have been entrusted to the Navy.

D5 LIFE EXTENSION PROGRAM

The next priority I would like to discuss is SSP's life extension efforts to ensure an effective and reliable sea-based deterrent. We are executing the Trident II (D5) Life Extension Program in cooperation with the United Kingdom (U.K.), under the auspices of the Polaris Sales Agreement. I am pleased to report that our long-standing partnership with the U.K. remains strong.

The Trident II (D5) SWS continues to demonstrate itself as a credible deterrent and meets the operational requirements established for the system almost 30 years ago. We have successfully conducted 135 consecutive flight tests of the D5 missile and continue to exceed our required performance. This record of success demonstrates our Navy's ability to respond if called upon. Our allies and any potential rivals are assured the U.S. strategic deterrent is ready, credible, and effective.

However, we cannot simply rest on our successes. The Trident II (D5) SWS has been deployed on our *Ohio*-class ballistic missile submarines for over 20 years, and is planned for operational deployment for at least another 30 years, making it operational longer than any other missile system SSP has deployed. We must remain vigilant of age-related issues to ensure a continued high level of reliability.

The Navy is proactively taking steps to address aging and technology obsolescence. SSP is extending the life of the D5 Strategic Weapon System to match the *Ohio*-class submarine service life and to serve as the initial baseline mission payload for the *Ohio* replacement submarine platform. This is being accomplished through an update to all the Trident II (D5) SWS subsystems: launcher, navigation, fire control, guidance, missile and reentry. Our flight hardware—missile and guidance—life extension efforts are designed to meet the same form, fit, and function of the original system, in order to keep the deployed system as one homogeneous population and to control costs. We will also remain in continuous production of energetic components such as solid rocket motors. These efforts will provide the Navy with the missiles and guidance systems we need to meet operational requirements.

SSP previously restructured the D5 Life Extension Program to ensure sufficient time for additional missile electronics design evolutions. I am pleased to report that our restructured program is on track. SSP successfully conducted a system Critical Design Review of the missile electronics in January 2011. Our life extended guidance system also completed its Critical Design Review and is scheduled for its first flight test in fiscal year 2012. Our first flight test of a D5 life extended missile is scheduled in fiscal year 2013. The Initial Operating Capability of the combined missile and guidance systems is scheduled in fiscal year 2017.

Another major step to ensure the continued sustainment of our SWS is our SSP Shipboard Integration (SSI) efforts, which utilizes open architecture and commercial off-the-shelf hardware. The first increment of this update is now being installed throughout the fleet and training facilities. To date, installation is complete on four U.S. SSBNs and two U.K. SSBNs. This effort is a technical obsolescence refresh of shipboard electronics hardware and software upgrades, which will provide greater maintainability of the SWS and ensure we continue to provide the highest nuclear weapons safety and security for our deployed SSBNs. The first end-to-end operational test of the SSI Increment 1 was successfully conducted in March 2011 on the USS *Nevada* (SSBN 733).

To sustain the SWS, SSP is extending the life of the W76 reentry system through a refurbishment program known as the W76–1. This program is being executed in partnership with the Department of Energy, National Nuclear Security Administration. The W76–1 is now in full production and has achieved Initial Operating Capability. The W76–1 refurbishment maintains the military capability of the original W76 for approximately an additional 30 years. This program successfully incorporated commercial off-the-shelf hardware and other economies to achieve Navy component production costs 75 percent less than previous nuclear arming, fuzing, and firing systems.

In addition to the W76–1, the Navy is in the initial stages of refurbishing the W88 reentry system. The Navy is collaborating with the Air Force to reduce costs through shared technology. This refurbishment will reach Initial Operation Capability in the SLBM Fleet in 2018. These programs will provide the Navy with the weapons we need to meet operational requirements throughout the *Ohio* service life and the planned follow-on platform.

OHIO REPLACEMENT PROGRAM

My third priority and one of the highest Navy priorities is the *Ohio* Replacement Program. The continued assurance of our sea-based strategic deterrent requires a credible SWS as well as the development of the next class of ballistic missile submarines. The Navy team is taking aggressive steps to ensure the *Ohio* Replacement Program is designed, built and delivered on time with the right capabilities at an affordable cost. The Office of the Secretary of Defense (OSD) Defense Acquisition Board approved the *Ohio* Replacement Program Milestone A in January 2011 and authorized entry into the Technology Development Phase.

The Navy team has the benefit of leveraging the success of the *Virginia* class build program and the opportunity to implement many of those lessons-learned to help ensure we design the *Ohio* replacement for affordability both in terms of the acquisition and life cycle maintenance. Maintaining this capability is critical to the continued success of our sea-based strategic deterrent now and into the future.

The *Ohio* Replacement Program will replace the existing 14 *Ohio*-class submarines. To lower development costs and leverage the proven reliability of the Trident II (D5) SWS, the *Ohio* replacement will enter service with the Trident II (D5)

SWS and D5 life-extended missiles onboard beginning in 2029. These D5 life extended missiles will be shared with the existing *Ohio* class submarine for approximately 13 years until the *Ohio*-class retires. Maintaining one SWS during the transition to the *Ohio*-class replacement is beneficial from a cost, performance, and risk reduction standpoint.

A critical component of the *Ohio* Replacement Program is the development of a Common Missile Compartment that will support Trident II (D5) deployment on both the *Ohio* class replacement and the successor to the U.K. Vanguard Class. The United States and the United Kingdom have maintained a shared commitment to nuclear deterrence through the Polaris Sales Agreement since April 1963. The United States will continue to maintain its strong strategic relationship with the U.K. for our respective follow-on platforms, based upon the Polaris Sales Agreement. As Director, SSP I am the U.S. executor of this agreement. Our programs are tightly coupled both programmatically and technically to ensure we are providing the most cost effective, technically capable nuclear strategic deterrent for both nations.

The New START Treaty, which entered into force on February 5, and the Nuclear Posture Review (NPR) reinforce the importance of strategic submarines and the SLBMs they carry, as the most survivable leg of the Triad. The reductions in warheads and launchers will result in ballistic missile submarines carrying the majority of the Nation's strategic force. Our continued stewardship of the Trident II (D5) SWS is necessary to ensure a credible and reliable SWS is deployed today on our *Ohio* class submarines, as well as, in the future on the *Ohio* replacement.

The *Ohio* replacement will be a strategic, national asset whose endurance and stealth will enable the Navy to provide continuous, uninterrupted strategic deterrence into the 2080s. The development of this follow-on capability requires the cooperation of the executive branch and Congress to deliver an effective sea-based deterrent on time with the right capabilities to sustain the most survivable leg of our Triad at the right cost for many decades to come.

SOLID ROCKET MOTOR INDUSTRIAL BASE

The fourth priority I would like to discuss is the importance of the defense and aerospace industrial base. In particular, the decline of the Solid Rocket Motor industry has placed a heavy burden on Navy resources. The Navy is maintaining a continuous production capability at a minimum sustaining rate of 12 rocket motor sets per year through the Future Years Defense Plan. However, we have faced significant cost challenges as both the National Aeronautics and Space Administration (NASA) and Air Force demands have declined. We will continue to experience those cost increases if demand shrinks further in coming years.

Reduced industrial demand has resulted in overhead costs spread over a smaller customer base. The Navy's growing percentage of the Solid Rocket Motor business base has already resulted in increased unit costs. In addition, Trident II (D5) is the only program in production of Class 1.1 type propellant. This type of propellant is highly energetic and necessary for use in submarines due to volume constraints.

Navy added funding to the budget to address the unit cost increase. While these additional funds are essential for the continued production of D5 rocket motors, the long-term sustainment of this vital national capability must also be addressed.

We are working with our industry partners, the Department of Defense and Congress, to sustain the Solid Rocket Motor industrial base and find ways to maintain successful partnerships. The OSD (Industrial Policy)-led Interagency Task Force, with membership from Navy, the Air Force, OSD along with the Missile Defense Agency and NASA, is developing a Solid Rocket Industrial Base Sustainment Plan. SSP is an integral part of this process. We look forward to continuing this collaborative process to find an interagency solution to maintain this crucial national capability.

TODAY'S FORCE

The final topic I would like to address is our SSBN force. Our 14 U.S. Navy SSBNs, 8 of which are homeported in the Pacific and 6 in the Atlantic Fleet, continue to provide a credible, survivable and reliable sea-based strategic deterrent for our national leadership.

Last month, the USS *Nevada* (SSBN 733) successfully conducted her Demonstration and Shakedown Operation involving the launch and flight test of a Trident II (D5) missile and is now ready to return to strategic service. The completion of this test marks the 135th consecutive successful flight test of a D5 missile. Therefore, I am pleased to report to you the Trident SWS continues to demonstrate itself as a credible deterrent and meet the operational requirements established for the system almost 30 years ago.

USS *Tennessee* (SSBN 734) will soon complete her Engineering Refueling Overhaul, enter post availability testing, prepare for her Demonstration and Shakedown Operation, and return to the operational force in the spring of 2012. Two more of our SSBN submarines are undergoing Engineering Refueling Overhauls, which will maintain the viability of these platforms through the service life of the *Ohio* class.

We must continue to be vigilant of age-related issues to ensure the high reliability needed for our SWS. With the Trident II (D5) missile planned for operational deployment through the service life of the *Ohio* class and as the initial payload on the *Ohio* replacement, D5 hardware will age beyond our previous experience base and will be operational almost twice as long as any previous sea-based strategic deterrent. Therefore, SSP has adjusted our flight testing philosophy to focus on older flight hardware in order to best predict aging characteristics. We tested our oldest missile to date from the USS *Nevada* last month. The first and second stage rocket motors were nearly 22 years old.

CONCLUSION

This is an exciting time to be the Director at SSP. The New START Treaty reduces both deployed and nondeployed nuclear weapons, which will require the United States to continue to rely heavily on the survivable capability provided by ballistic missile submarines. The ballistic missile submarine is only one leg of the nuclear Triad. Land-based ICBMs, nuclear capable heavy bombers, and the SSBN force work together to provide the total U.S. nuclear deterrent. Each leg of the deterrent provides unique capabilities.

The 2010 NPR also committed to strengthen conventional capabilities and reduce the role of nuclear weapons in deterring non-nuclear attacks, with the objective of making deterrence of nuclear attack on the United States or our allies and partners the sole purpose of U.S. nuclear weapons. SSP stands ready to support and participate in future Conventional Prompt Global Strike efforts should leadership authorize our participation. However, the NPR makes clear that as long as nuclear weapons exist, the United States will sustain a safe, secure and effective nuclear deterrent. This includes modernizing nuclear weapons infrastructure; sustaining the science, technology and engineering base; investing in human capital; and ensuring that these goals remain a senior leadership focus. As the Navy's primary stakeholder, SSP is accountable for the technical oversight, safety, and security of Navy nuclear weapons and we understand the vast responsibility entrusted to us.

Our Nation's sea-based deterrent has been a critical component of our national security since the 1950s and will continue to assure our allies and deter our enemies well into the future. I am privileged to represent this unique organization as we work to serve the best interests of our great Nation.

Senator NELSON. General Kowalski.

STATEMENT OF LT. GEN. JAMES M. KOWALSKI, USAF, COMMANDER, AIR FORCE GLOBAL STRIKE COMMAND, U.S. AIR FORCE

General KOWALSKI. Chairman Nelson, Ranking Member Sessions, I'm honored to appear before you today for the first time as commander of Air Force Global Strike Command, representing nearly 24,000 airmen and civilians. With strong support from Secretary Donley and General Schwartz, we have pursued three parallel efforts: the standup of a new major command, execution of current operations in support of our combatant commanders, and establishing a culture that embraces the special trust and responsibility nuclear weapons require.

We're now fully engaged on our core organize, train, and equip tasks. Our new headquarters is about 81 percent of our authorized strength and we've established the organizational structure and processes necessary to execute the mission. Our work in revitalizing the nuclear enterprise is ongoing, as we build upon relationships between all the stakeholders representing the Services, the combatant commands, and other Federal agencies.

We established a number of new training programs tailored to the nuclear and global strike missions. These programs develop expertise throughout the nuclear enterprise, to include operations, maintenance, intelligence, and security forces. As we worked to equip our forces, we assumed lead major command responsibilities for the Minuteman III, UH–1N helicopter, B–2 and B–52 bombers, air-launched cruise missiles, gravity nuclear weapons, and Air Force nuclear command and control.

As we go forward, I see three major challenges for the command. First, we must consolidate the gains of the last few years across the nuclear enterprise. We will continue to mature our headquarters and be rigorous in the examination of our processes. Second, we have to achieve enduring cultural change in our nuclear enterprise, while also aggressively supporting the current conventional fight. Our bomber forces are more than just dual-capable; they are full spectrum. Recent B–2 and B–1 missions into Libya from bases in the United States show how quickly a crisis can develop and how long-range bombers can rapidly bring flexible combat power to a joint commander.

Finally, we must sustain and enhance our current force while preparing to meet the challenges of the future. At Air Force Global Strike Command we recognize our responsibility to be efficient and effective stewards of resources. Our goal is to instill a culture that consistently encourages innovation and fosters productivity.

Our central mission remains unchanged: to develop and provide combat-ready forces for nuclear deterrence and global strike operations in support of the President and the combatant commanders.

Mr. Chairman, I want to thank you and the members of the committee again for the opportunity to discuss the status and future of Air Force Global Strike Command, and I look forward to your questions. Thank you.

[The prepared statement of General Kowalski follows:]

PREPARED STATEMENT BY LT. GEN. JAMES M. KOWALSKI, USAF

INTRODUCTION

Chairman Nelson, Ranking Member Sessions, and distinguished members of the subcommittee; I am honored to appear before you today for the first time as the Commander of Air Force Global Strike Command, representing nearly 24,000 dedicated airmen and civilians.

I would like to update you on the current status of the command, some of our progress since my predecessor, Lieutenant General Klotz, last testified in March 2010, and what I see as our central challenges.

CURRENT STATUS

On 30 September 2010, Air Force Global Strike Command declared full operational capability. As we built this command, the first completely new Air Force major command (MAJCOM) in 27 years, the rest of the world did not pause. Some of the events that have shaped our development over the last year include the Nuclear Posture Review, the New START, and as a reminder of our conventional responsibilities, ongoing operations in support of U.S. Africa Command.

Our efforts during the last year to strengthen the nuclear enterprise involved three parallel efforts: the methodical stand-up of a new major command and headquarters, the disciplined execution of current operations in support of U.S. Strategic Command (STRATCOM) and the geographic combatant commanders, and the enduring effort to establish a culture that embraces the special trust and responsibility of nuclear weapons.

As we approach our planned manpower levels and have the initial tasks associated with standing up the Headquarters behind us, we must now focus on building

the relationships and processes both internal and external to the command. We are pleased by the progress the headquarters has made in assuming responsibilities for guidance and oversight of our forces. We continue to mature our processes in developing fiscal guidance and plans within the Air Force corporate structure. The connective tissue between organizations within the command is getting stronger as the units align to our priorities, metrics, and battle rhythm. In declaring full operational capability, we closed out 696 specific action items under Programming Plan 09–01 that ranged from the broad task of establishing the initial Air Force Global Strike Command structure to specific tasks such as the identification of formal training quotas.

On any given day we have 1,100 airmen deployed or on standby to support STRATCOM in the missile complexes and about another 1,100 deployed in support of our regional combatant commanders. In addition, we stand ready to deploy up to 16 B–2s and 44 B–52s along with a range of combat support capabilities to support national taskings.

AIR FORCE GLOBAL STRIKE COMMAND PROGRESS

With the completion of initial stand-up activities, we were able to fully focus on our strategic master plan and make headway on our goals, objectives, and tasks. Although much work remains, I would like to share some of the progress we have made in our core areas of organize, train, and equip.

AIR FORCE GLOBAL STRIKE COMMAND—ORGANIZE

Our ongoing efforts to organize the Air Force's newest MAJCOM have included standing up the Headquarters, defining our role within the nuclear command, control, and communications system (NC3), establishing the 69th Bomb Squadron at Minot Air Force Base, the stand-up of General Officer Steering Groups in support of each of our weapons systems, providing Air Force Office of Special Investigations support to our missile convoys, and re-establishing the presence of Intelligence Officers in our Missile Wings.

Standing up the headquarters presented a unique challenge the Air Force had not faced in 27 years. We are now operating at 81 percent of our authorized strength and we have established the Headquarters organizational structure, battle rhythms, metrics, and reviews necessary to execute the mission.

"Air Force Global Strike Command serves as the lead MAJCOM for 14 major NC3 systems. In that capacity we provide a clear and strong voice for NC3 sustainment and modernization. Additionally, our staff has successfully integrated 14 previously dispersed NC3 programs into a unified and cohesive Global Strike Command NC3 portfolio. This translates into greater command situational awareness and management of these vital programs."

On 30 June of this year, the 69th Bomb Squadron will declare Full Operational Capability under the 5th Bomb Wing at Minot Air Force Base. The Air Force activated the 69th in September 2009 to better balance operational taskings with the addition of a fourth B–52 squadron, with two at Minot and two at Barksdale.

We have also organized new General Officer Steering Groups (GOSGs) dedicated to sustaining each of our assigned weapon systems. These GOSGs focus on warfighter concerns, prioritize sustainment initiatives, and remove obstacles in order to keep Air Force Global Strike Command's assigned weapons systems capable and available. GOSG participation includes members of the Headquarters staff, senior representatives from Air Force Material Command and the Defense Logistics Agency, leadership from each of Air Force Global Strike Command's wings, and the National Nuclear Security Administration. Through this steering group process, funds and focus have been reprioritized to address issues with aging support equipment, diminishing manufacturing resources, supply parts support, and parts availability.

We are now organized to provide the sole Response Task Force for any Air Force nuclear incident in the continental United States and stand ready to assist the Department of Energy and U.S. Air Forces in Europe (USAFE). An aggressive training schedule will culminate with participation in our first full scale national response exercise in May 2012.

Another organizational initiative is the revitalization of the Nuclear Weapons Stakeholder Partnership Meeting. This semi-annual meeting is the framework for discussion on specific nuclear weapon issues and is a forum for building relationships and trust between organizations from the Air Force, Navy, STRATCOM, USAFE, Defense Threat Reduction Agency, Department of Energy, and the National Labs. We look forward to our next meeting at Barksdale Air Force Base later this month.

Over the course of the past year Air Force Global Strike Command and the Air Force Office of Special Investigations (OSI) has teamed up to close a 4-year gap in Federal law enforcement support to off-base nuclear convoys. Air Force OSI agents have joined our Security Forces in the convoy, and provide an important link to local, state, and Federal law enforcement.

Conducting inspections is a critical MAJCOM function, and we have made significant progress in this area as well. Over the course of the last year, our Inspector General, starting from scratch, built an 86-person inspection team fully capable of inspecting our bomber and missile wings. This team has been able to combine the inspection philosophies and instructions from Air Combat Command and Air Force Space Command to produce specific Air Force Global Strike Command direction for inspections throughout the nuclear enterprise.

Finally, I am pleased to report that for the first time in nearly a decade, we have taken the steps necessary to send Intelligence Officers back into Missile Wings. Improving intelligence support to our nuclear forces was a key recommendation of the Schlesinger report and will enhance missile crew situational awareness, their understanding of strategic threats, and the vital role they play in the defense of our Nation.

AIR FORCE GLOBAL STRIKE COMMAND—TRAIN

In December 2008, the Report of the Secretary of Defense Task Force on Department of Defense (DOD) Nuclear Weapons Management identified the need for more nuclear-qualified and experienced personnel. Filling positions designated for personnel with nuclear experience is a command priority, and tailored training plays a major role in consolidating the gains we have made across the nuclear enterprise. Therefore, we established a number of programs to build upon the excellent basic military training and initial skills training that other Air Force organizations provide.

On 30 March 2009, the Chief of Staff of the Air Force approved the creation of an Intercontinental Ballistic Missile Weapons Instructor Course (WIC) at the U.S. Air Force Weapons School (USAFWS), Nellis Air Force Base, NV. The mission of the ICBM WIC is to produce weapons officers to lead weapons and tactics development and provide in-depth expertise throughout the ICBM community and the nuclear enterprise. On 19 December 2010, the USAFWS graduated the first four students from the ICBM WIC. Three of these graduates have returned to our ICBM units to stand up the first weapons and tactics flights. These weapons officers, well versed in the nuclear enterprise, can serve as the lead integrator on issues related to operations, maintenance, and security forces at the missile units. The ICBM WIC is on track to produce eight graduates per year.

One of our newest programs is an Intelligence Formal Training Unit designed to help our unit intelligence teams support the nuclear and global strike mission. We will host 5 courses in fiscal year 2011 and will train approximately 100 nuclear intelligence professionals to fully understand the daily deterrence mission.

For our security forces, helicopter crews, and convoy drivers, we conduct graduate level training at Camp Guernsey in Wyoming and expect to expand our investment there over the next few years. We have significantly increased our nuclear security training program with emphasis on tactical expertise, marksmanship, and small unit leadership. This training allows integration of security forces, helicopter crews, and maintenance personnel into a cohesive and effective security team. Training together as a team, these warfighters maximize the capabilities necessary to protect our Nation's most vital resources and most powerful weapons. Additionally, we expanded our training capacity to include 8th Air Force's nuclear bomber security forces alongside the 20th Air Force intercontinental ballistic missile security forces in our tactical security training classes.

AIR FORCE GLOBAL STRIKE COMMAND—EQUIP

Air Force Global Strike Command assumed lead command responsibilities for the Minuteman III and UH–1N helicopter weapon systems from Air Force Space Command on 1 December 2009, and for the B–2 and B–52 dual capable bombers from Air Combat Command on 1 February 2010. Our four major weapons systems are on average, over 40 years old, and this includes our "new" 22-year-old B–2 bombers.

EQUIP: B–52S

We have been successful in investing in multiple B–52 platform improvements to address both modernization and sustainment. The Combat Network Communications Technology (CONECT) program is the most significant B–52 modernization program since 1980 and will add 21st century capability to the aircraft. CONECT

ground testing is ongoing at Edwards Air Force Base. We have also recently tested a bomber flight control software block upgrade that will significantly improve Advanced Targeting Pod capabilities and provide the interface to employ Miniature Air-Launched Decoys, and have started the Military Standard-1760 Internal Weapons upgrade program which will enable the carriage of 8 modernized smart weapons in the bomb bay, such as the Global Positioning System-guided Joint Direct Attack Munition, increasing the total aircraft load-out from 12 to 20 Precision Guided Munitions.

In the near-term, the B–52 needs upgrades to its anti-skid system, it needs airspace access upgrades such as the Mode S/5 transponder for real-time aircraft identification, data, and position, and it needs a new radar as the current radar is based on 1950s technology and may be unsupportable by 2016. We also need to resolve a safety of flight issue with the installation of the MultiMode Receiver 2020 Instrument Landing System Receiver that brings the aircraft in compliance for frequency modulation immunity, a requirement that previously restricted B–52 aircraft transiting European airspace and using European airfields.

EQUIP: B–2S

We made significant progress with the B–2 Radar Modernization Program during the past year, completing 4 aircraft and bringing the fleet total to 12 upgraded aircraft. Air Force Global Strike Command increased maintainability of the upgraded radar system by accelerating technical data deliveries and by maximizing antenna diagnostic and prognostic capabilities through software enhancements. We have also completed integration of the Massive Ordnance Penetrator with the B–2 aircraft, giving the warfighter increased capability against hardened and deeply buried targets.

We made progress in addressing B–2 aircraft parts obsolescence issues through weekly teleconferences across the B–2 enterprise to track current problem parts and project future parts issues. Improved communication, proactive planning, and procurement, as well as new logistics models for small fleet management, have decreased the B–2 monthly non-mission capable supply rate by one third since February 2010.

For the B–2, we also must meet national requirements for nuclear command and control—the program of record is the extremely high frequency satellite communications. This upgrade not only meets nuclear requirements, it provides wideband "net-ready" beyond-line-of-site connectivity for full spectrum operations.

EQUIP: UH–1NS AND CVLSP

Bombers are not the only aviation weapons systems vital to our mission in Air Force Global Strike Command. The UH–1N (Huey) Helicopter has served the Air Force well since 1970, primarily in providing missile field support, convoy security, and ferrying missile crews and maintenance teams to and from the missile complexes and providing aerial security surveillance of remote ICBM facilities. However, mission requirements changed in the late 1990s, and again after the terrorist attacks on September 11.

The Air Force currently operates 62 UH–1N aircraft which do not meet all of the vertical lift requirements in our missile fields, nor in the AF District of Washington. Post-September 11, DOD determined an urgent need for vertical lift improvements over the current UH–1N. For AF Global Strike Command, the Huey's primary role is to provide a robust and agile missile field security capability. Presently, the UH–1N fleet does not meet missile complex security requirements for endurance, speed, and payload. In addition to the UH–1N's clearly defined capability gaps, there are not enough UH–1N aircraft to meet the security needs for our nuclear enterprise and the missions in the Military District of Washington. Finally, the UH–1N's advanced age is manifesting itself in the form of airframe cracks. Cracks in the UH–1N's lift beam area and tail boom assembly present the challenge of keeping a 40-year-old aircraft combat mission ready while working through the issue of parts availability and obsolescence.

The risk we assume with the current helicopter is unacceptable and the need for a replacement helicopter is both urgent and compelling. As lead MAJCOM, we will continue to advocate for the Common Vertical Lift Support Platform (CVLSP) to ensure the safety and security of missile field operations and to meet the requirement posed by Air Force District of Washington continuity of operations and government missions for the National Capital Region.

EQUIP: ICBMS

Turning now to ICBMs, the Minuteman III is congressionally mandated to be in service until 2030. We're in a modernization program to reach 2020, and Air Force Materiel Command is exploring what will be required to reach 2030. Since 1962, the Minuteman "family" has been updated from the MMI, to the MMII, to the MMIII, and there have been upgrades and modifications to each of those respective models. We made significant strides in the past year toward completing the Propulsion Replacement Program, which marks the full deployment of new solid fuel stage motors and refurbished flight controls across the entire force to extend booster service life through the end of this decade. We will reach completion on this major effort when the last two boosters are in place this month.

While the Minuteman missiles have been upgraded and modified, the infrastructure supporting these missiles is still early 1960s era equipment and we will ensure our reviews include this element of the weapon system. Along those lines, we began, with the support of Air Force Materiel Command, a depot overhaul program for the fleet of 23-year-old Transporter Erector Vehicles and silo emplacement vehicles. We have established requirements for a Transporter Erector Vehicle replacement and have begun development of the new Payload Transporter vehicle. The new ICBM Payload Transporter will introduce physical security technologies into the reentry system transport vehicle, to include advanced security delay features with stand-off command and control activation capability. I want to thank Congress for funding this program at $117.8 million across the Future Years Defense Program, and we should see the first Payload Transporter deliveries in fiscal year 2015.

These handling equipment sustainment efforts will significantly enhance the safety and security of daily operations across our three ICBM bases and supports modernization and upgrade necessary to extend Minuteman III through 2030. Additionally, these efforts will enable the Air Force to execute activities required for implementation of New START.

EQUIP: ICBM SECURITY IMPROVEMENTS

We have taken a number of steps to provide our security forces with the equipment and technology they need to protect and defend our Nation's nuclear deterrent.

Air Force Global Strike Command has purchased 152 armored vehicles to better protect our security forces and meet DOD requirements. Some of these new armored vehicles have been delivered to our wings, and delivery will be complete no later than calendar year 2013.

We are in the process of fully deploying new Remote Visual Assessment (RVA) equipment to assist security forces monitoring of the ICBM missile complexes. RVA enhances situational awareness, and helps security forces tailor the responding forces in accordance with the assessed threat. We are transitioning from a satellite dependent RVA system to a terrestrial system that increases both performance and responsiveness at a lower long term operating cost. In addition, we are modernizing our security sensor systems used to protect our above-ground weapons storage areas, with completion of the upgrade at Minot Air Force Base, ND, this year.

EQUIP: LONG-RANGE STRIKE FAMILY OF SYSTEMS

We are strong advocates and partners in the development of a long-range strike (LRS) family of systems that will provide a visible deterrent and global strike capability well into the future. The Air Force LRS strategy uses a family-of-systems construct consisting of three precision-strike pillars: a long-range strike platform, a long-range standoff missile, and a conventional prompt global strike capability. Both Secretary Gates and Secretary Donley have made a commitment to a new nuclear capable, long-range penetrating bomber.

CHALLENGES

Air Force Global Strike Command faces three central challenges. First, we must consolidate the gains we have made across the nuclear enterprise. Second, we must achieve enduring cultural change in our nuclear enterprise while also aggressively supporting the current conventional fight. Finally, we must sustain and enhance our current force while preparing to meet the challenges of the future with innovative solutions. I am proud of the progress our airmen have made, and as I address these challenges through this testimony, I will share my perspective on Air Force Global Strike Command's significant accomplishments.

CONSOLIDATING OUR GAINS

Now that we have established the Command and declared full operational capability, we must consolidate our gains, sustain momentum, and provide stability to the enterprise while continuing to pursue improvements. One example is our recent initiative to capture and categorize recommendations or findings relating to our nuclear alert forces. In partnership with the Air Force Materiel Command, we are reviewing studies, assessments, reports, and other documents dating back to 1990 to audit the recommendations and follow through with the findings that have not been executed, funded, and/or mitigated. Any open recommendations will be worked to resolution or prioritized and tracked for later action according to fiscal constraints and level of risk.

SUSTAIN CONVENTIONAL CAPABILITIES

Our second challenge is to achieve enduring cultural change in our nuclear enterprise while also aggressively supporting the current conventional fight. Our bomber forces are more than just dual-capable—they are full-spectrum. Having both a nuclear and conventional mission is not something new for our bomber units. Nuclear capable bombers participated in numerous conventional operations from Korea through Operation Desert Storm. During the Cold War, the conventional employment of bombers was seen as a distraction from the core mission of nuclear deterrence. However, since the end of the Cold War, providing support to conventional operations has been a core mission enhanced by developments in stealth; precision; intelligence, surveillance, and reconnaissance; and joint connectivity. Our nuclear capable bombers, with enhanced conventional capabilities and training, have excelled in Operations Southern Watch, Allied Force, Enduring Freedom, Iraqi Freedom, and Odyssey Dawn.

To help our commanders strike this balance, we executed a year-long review of our Designed Operational Capability statements for every unit in the command. We ensured that the units' missions, resources, and readiness metrics are clearly linked to the combat power or the combat support required by the joint warfighter.

Today, our B–52s and B–2s rotate to Guam to provide continuous long-range strike presence and proven combat capability to the commander of U.S. Pacific Command. Furthermore, our recent B–2 missions into Libya show how quickly a crisis can develop, and how long-range bombers can rapidly bring flexible combat power to a joint commander. As a command, we must continue to evolve long-range strike as a core competency to ensure no adversary has complete freedom of action.

PREPARING FOR THE FUTURE CHALLENGES

Finally, we must sustain and enhance our current force while preparing to meet the challenges of the future. Sustaining our aging platforms and meeting current commitments competes for the resources we need to modernize our forces in advance of future threats.

Secretary Gates has directed a thorough and vigorous scrub of military bureaucratic structures, business practices, modernization programs, civilian and military personnel levels, and associated overhead costs. At Air Force Global Strike Command we recognize our responsibility to be efficient and effective stewards of resources. To achieve both efficiency and effectiveness requires a commitment to creating a climate where productivity improvements—faster, better, cheaper—thrive. As Secretary of Defense Gates has said, "We have not seen the productivity growth in the defense economy that we have seen and expect from the rest of the economy."

This is an opportunity to achieve not just efficiency targets for the next few budget cycles, but to institutionalize the processes, education, and mindset to encourage, reward, and implement operational innovation. Our goal is to instill a culture that consistently encourages innovation and to foster airmen for whom productivity improvements are second nature. We will ensure they have a command structure that allows their ideas to be raised, vetted, and implemented. We must be more productive in ways we have not been in the past while remaining focused on the daily execution of our missions.

SUMMARY OF CHALLENGES, SPECIAL TRUST, AND RESPONSIBILITY

In conclusion, we have made great strides in the last year, and Americans can be proud of what the Airmen assigned to Air Force Global Strike Command accomplished since we last testified before your committee in 2010. We must now consolidate those gains and continue to forge a culture that recognizes the special trust and responsibilities of the most powerful weapons in our Nation's arsenal; we must

do this while aggressively supporting the current fight; and we must sustain and enhance our force while preparing for future challenges.

The existence of Air Force Global Strike command reflects the commitment of the Air Force to ensure the United States maintains a safe, secure, and effective nuclear deterrent, and the importance of the global strike mission.

Thank you.

Senator NELSON. Thank you, General.

General Chambers.

STATEMENT OF MAJ. GEN. WILLIAM A. CHAMBERS, USAF, ASSISTANT CHIEF OF STAFF FOR STRATEGIC DETERRENCE AND NUCLEAR INTEGRATION, U.S. AIR FORCE

General CHAMBERS. Chairman Nelson, Ranking Member Sessions: Thank you for the opportunity to discuss your Air Force's strategic deterrent forces. Your Air Force nuclear enterprise consists of 450 ICBMs, 96 bombers, squadrons of F–16C and F–15E dual-capable fighters, and the thousands of dual-capable airmen who operate and sustain them. These weapons systems and dedicated airmen maintain the credibility of a strategic deterrent that requires a long-term visible commitment.

Continuing to strengthen our nuclear enterprise remains the number one Air Force priority. Our Secretary and Chief of Staff have ingrained the Air Force's commitment to and are sustaining the focus on the nuclear enterprise. My written statement lays out their specific strategic guidance and I respectfully request that statement be entered into the record. Today I simply highlight the following areas: human capital, modernizing and recapitalizing, the NPR and New START.

When the Air Force established reinvigoration of the nuclear enterprise as our top priority, we included our most precious resource, our airmen, as an integral part of that effort. In response, the nuclear and personnel communities jointly created an analytical process resulting in a comprehensive nuclear enterprise human capital effort which lays out the active management steps required to deliberately develop airmen and their nuclear expertise.

From investing in our people to investing in our systems, every weapons system in the Air Force's nuclear enterprise is undergoing some form of modernizing or recapitalizing. Successful deterrence over the next 2 decades requires sustaining and modernizing our force structure in a consistent, year-by-year deliberate manner.

During the next 7 years, implementation of the NPR and New START will bring a reduction in the role and numbers of nuclear weapons in our national security strategy. Our final force structure will meet the combatant commander's requirements and maintain overall effectiveness of the deterrent force.

The President's fiscal year 2012 budget request reflects the positive steps we are taking to improve this Air Force core function. Across the FYDP, Air Force investment in nuclear deterrence operations totals $28 billion. The Air Force is committed to ensuring this investment results in systems and capabilities that best operationalize strategic deterrence for our Nation.

The national military strategy acknowledges our Nation's security and its prosperity are inseparable and preventing wars is as important as winning them and far less costly. In this time of constrained resources, the efficacy of nuclear deterrence operations is

evident in the fact that for approximately 3 percent of the Air Force total obligation authority your Air Force continues to deliver the bedrock of global strategic stability, providing the ICBM and bomber legs of the triad, as well as dual-capable fighter capability 24 hours a day, 7 days a week, 365 days a year.

Thank you for this subcommittee's continued support of America's Air Force and particularly its support to our airmen and the strategic deterrence they provide.

[The prepared statements of General Chambers, General Scott, and General Harencak follows:]

PREPARED STATEMENT BY MAJ. GEN. WILLIAM A. CHAMBERS, USAF

INTRODUCTION

Chairman Nelson, Ranking Member Sessions, distinguished members of the subcommittee, thank you for the opportunity to discuss your Air Force's strategic deterrent forces.

In pursuit of the President's vision as outlined in the Nuclear Posture Review to "reduce U.S. nuclear weapons and their role in U.S. national security strategy," the Air Force takes to heart its responsibility to uphold the entirety of his vision and pledge, " . . . [that] as long as nuclear weapons exist, the United States will maintain a safe, secure, and effective arsenal, both to deter potential adversaries and to assure U.S. allies and other security partners that they can count on America's security commitments." We employ that arsenal to produce strategic deterrence that remains vital at a time when our National Military Strategy notes, " . . . ongoing shifts in relative power and increasing interconnectedness in the international order indicate a strategic inflection point." Maintaining credibility of our strategic deterrent requires a long-term, visible commitment to our nuclear capabilities.

CONTINUE TO STRENGTHEN—THE AIR FORCE'S #1 PRIORITY

Continuing to strengthen our nuclear enterprise remains the number one Air Force priority. A year ago, testimony before this committee recounted Air Force efforts to reinvigorate our nuclear enterprise. That focus significantly advanced our structure, processes, and culture. Our focus now is on making sure those advances endure.

Since last year's testimony, Air Force Global Strike Command (AFGSC), as the first major command stood up in 27 years, is the most visible structural change taken to ensure focused operational oversight and proper support to U.S. Strategic Command. AFGSC now has full operational command of our Intercontinental Ballistic Missile (ICBM) and nuclear-capable bomber forces and is continually focused on the airmen and their weapon systems that produce strategic deterrence every day. Additionally, the Air Force designated Nuclear Deterrence Operations as 1 of 12 Service Core Functions to ensure alignment of policy and resources. These are just two of the many changes to structure, process and culture that reflect a concerted effort to institutionalize our reinvigoration initiatives and maintain safe, secure, and effective nuclear capabilities.

The Secretary of the Air Force and Chief of Staff of the Air Force articulated strategic guidance to ingrain the Air Forces' commitment to sustained focus on the nuclear enterprise.

- Strengthen Positive Inventory Control of Nuclear Weapons Related Materiel
- Refine Inspection Processes
- Fulfill Human Capital Plan to Ensure Appropriate Expertise at All Levels
- Modernize and Recapitalize Nuclear Deterrent Capability
- Implement New START
- Craft a Comprehensive Deterrence and Crisis Stability Vision that Builds on the Nuclear Posture Review

The initiatives in the President's budget request will build on successes achieved since 2008 and enable the Air Force to Continue to Strengthen along these Strategic Steps to maintain safe, secure, and effective nuclear capabilities.

STRENGTHEN POSITIVE INVENTORY CONTROL OF NUCLEAR WEAPONS RELATED MATERIEL

Efforts continue to tighten, assess, and automate accountability for Nuclear Weapons Related Materiel through a completely revamped Positive Inventory Control process. To improve accountability, sustainment activities such as these have been consolidated under a vastly revitalized Air Force Nuclear Weapons Center. The Air Force now has improved visibility of our worldwide inventories and accountability continues to improve.

REFINE INSPECTION PROCESSES

We have seen positive results from the current inspection regime across the board. We have reinforced our long-held nuclear standards and we will continue to examine the size and scope of the inspections required to "sustain" excellence, focusing on effectiveness. We will continue critical self-inspection, Nuclear Surety Staff Assistance Visits, and Nuclear Surety Inspections. The goal is to bolster resolute attitudes of exacting compliance and strict adherence to prescribed standards with continual self-assessment. We now perform Root Cause Analysis on all major write-ups, track them and brief progress of corrective actions to Air Force leadership. Senior Air Force leaders continue to review inspection results and other key indicators on a frequent and recurring basis.

FULFILL HUMAN CAPITAL PLAN TO ENSURE APPROPRIATE EXPERTISE AT ALL LEVELS

When the Air Force established reinvigoration of the Nuclear Enterprise as our top priority, we included our most precious resource . . . our airmen . . . as an integral part of the effort.

In response, the nuclear and personnel communities jointly created an analytical process resulting in a comprehensive Nuclear Enterprise Human Capital Execution Plan. This action plan focuses on synchronizing the Air Force's Continue to Strengthen objectives that relate to development of airmen and their nuclear expertise.

As a result of collaborative efforts across all nuclear specialties, we have instituted changes to improve the long-term professional fitness of our people. Over the past year, we have scrutinized our small, critical nuclear career fields, and recognized that in this era of small total force numbers and dual capability requirements, we must take innovative steps to optimally manage, grow, and retain this specialized expertise. As a result, several initiatives are now underway that will improve operational effectiveness in these critical areas. In addition, the Air Force is testing a new Enlisted Developmental Team process starting with the nuclear enterprise, to ensure deliberate development of our senior noncommissioned officers to create a sustainable leadership bench. We have also moved out aggressively to retain nuclear talent, ramping up programs to target expertise and critical skills through retention incentives.

Recently, my organization was designated the Functional Authority for the Human Capital performing the Nuclear Deterrent Operations. As such, we are responsible for injecting strategic perspective in the array of nuclear-related human capital programs. This broadens the perspective of the human capital policy arm to the needs of the nuclear enterprise career fields, brings attention to some unintended consequences of broader policies, and allows for refinements in leveraging our skilled dual-capable nuclear airmen.

These changes allow us to deliberately develop and manage our nuclear-capable personnel. Air Force senior leaders have energized these efforts through advocacy, continuous, focused attention and regular review of nuclear initiatives.

MODERNIZE AND RECAPITALIZE NUCLEAR DETERRENT CAPABILITY

From investing in our people to investing in our systems, every weapon system in the nuclear enterprise is undergoing some form of modernization or recapitalization. Successful deterrence requires sustaining and modernizing our force structure in a consistent and deliberate manner. This is a vital contribution to the long-term credibility of our deterrent.

Air Force funding efforts maintain ongoing investment for the Minuteman III and support equipment programs to extend life expectancy through 2030, as directed by the 2010 National Defense Authorization Act. Ensuring consistent, adequate sustainment of MM III requires an investment strategy addressing cryptographic upgrades, ICBM fuze refurbishment, and modernizing data transfer technology. Additionally, the Air Force and the National Nuclear Security Administration (NNSA) plan to start a life extension program for the W78.

Although a decision on a follow-on ICBM is not needed for several years, the Nuclear Posture Review recognized the need for studies to inform a decision on Ground-Based Strategic Deterrence beyond 2030. In January 2011, AFGSC initiated study efforts appropriate to the early stages of the ICBM follow-on. Once these are complete, the study will move into a Materiel Solution Analysis (MSA) phase, which will include an Analysis of Alternatives (AoA). We plan to complete the MSA phase in fiscal year 2014.

Air Force modernization plans for our current B–52s and B–2 bomber fleet continue an effort to maintain a viable force. The B–2 is the only aircraft capable of long-range delivery of direct attack munitions in an anti-access environment. To ensure the B–2 can continue to operate in high threat environments, we have programs to modernize communication, offensive, and defensive systems. For the B–52, we have programs to modernize and sustain the communication, radar, and weapon delivery systems.

Beyond modernization of existing platforms, we recognize the changing threat environment of the future requires improved capabilities. To meet that need, the Air Force is programming for a long range, nuclear capable, penetrating bomber. This program will leverage mature technologies and follow streamlined acquisition processes and focus on affordability with unit cost targets informing design trades and ensuring sufficient inventory. The program will begin in fiscal year 2012 delivering an initial capability in the mid-2020s with a planned production of 80–100 bombers.

The Air Force will sustain the current Air Launched Cruise Missile (ALCM) until a follow-on advanced penetrating long-range stand off (LRSO) missile capability is fielded. We have multiple service life extension programs to ensure viability of the propulsion systems, guidance and flight control systems, and warhead arming components. Preparation activity began in November 2010. The AoA final report is due in May 2012. The Air Force has programmed for research, development, test and evaluation over the next 5 years for the development of LRSO.

The Air Force continues to program for a nuclear-capable F–35 to modernize the Dual-Capable Aircraft (DCA) fleet. The investment over the Future Year Defense Plan (FYDP) for F–35 DCA ensures effective transition of this capability from our legacy fleet.

The B61 Life Extension Program continues to be a top priority. The Air Force is committed, with the NNSA, to improve the safety and security of the B61 and ensure the Tail Kit Assembly acquisition schedule remains on track for a fiscal year 2017 First Production Unit delivery. The B61 will remain compatible with current nuclear capable platforms to maintain effectiveness against projected target sets for years to come. This will also ensure the United States retains the capability to forward-deploy non-strategic nuclear weapons in support of Alliance commitments.

The Air Force started the Common Vertical Lift Support Platform (CVLSP) program to address capability gap shortfalls in helicopter nuclear security support, and Continuity of Government/Continuity of Operations missions. The CVLSP program seeks to replace existing UH–1N fleet with an off-the-shelf, nondevelopmental aircraft. We are currently evaluating acquisition strategies to best meet warfighter requirements with a goal of an fiscal year 2015 Initial Operational Capability.

There are many other initiatives required to maintain a safe, secure, and effective arsenal. The Air Force will spend approximately $1 billion over the FYDP in critical areas, such as Transporter Erector Hoists, Weapons Load Trailers, Electronic Systems Test Sets, Weapons Storage and Security System (WS3), and Reentry System Test Set cables. The Air Force also continues its commitment to maintaining its history of safe and secure resource transportation. To this end, AFGSC is actively programming to rapidly replace the current Payload-Transporter vehicle with a model with improved safety and security features.

IMPLEMENT THE NUCLEAR POSTURE REVIEW & NEW STRATEGIC ARMS REDUCTION TREATY

During the next 7 years, implementation of the 2010 Nuclear Posture Review (NPR) and New START Treaty (NST) will bring a reduction in the role and numbers of nuclear weapons in our national security strategy. Under the NPR, the Air Force will remove multiple warheads from its ICBMs. Under NST, which entered into force on February 5, 2011, the United States and Russia will reduce the number of accountable strategic warheads from the current Moscow Treaty warhead limit of 2,200 to 1,550. Within the treaty's central limits on Strategic Delivery Vehicles, the Air Force will reduce the numbers of deployed ICBMs and convert some nuclear-capable B–52s to conventional-only capability. Final force structure will be based on meeting the combatant commander's requirements and maintaining overall effectiveness of the deterrent force. We are currently developing options to reach the

force levels specified in the treaty and have initiated the appropriate planning, programming, logistics, engineering and environmental studies to support these decisions, inform Congress, and meet treaty obligations.

For its part, the Air Force began formal data exchanges with Russia in March. Inspections and exhibitions of bombers and missiles will start this month. The Air Force will also begin actions necessary to reduce deployed bombers and missiles, convert some nuclear-capable B–52 bombers to conventional-only capability, and eliminate other assets such as, Peacekeeper silos, 564th Missile Squadron silos, and B–52s to comply with central treaty limits. These actions must be completed by February 2018.

Global Strike Command will lead the Air Force portion of this effort. Lieutenant General Kowalski and his team of dedicated professionals are finalizing implementation and compliance plans to ensure the safety and security of our nuclear force as we draw down to NST mandated levels, all the while preserving the ability to deter adversaries, and assure allies and partners.

In preparing for the new verification regime, the Air Force is also working closely with the Office of the Secretary of Defense and U.S. Strategic Command.

CRAFT A COMPREHENSIVE DETERRENCE AND CRISIS STABILITY VISION THAT BUILDS ON THE NUCLEAR POSTURE REVIEW

As we think about providing deterrence in the 21st century, it's important to remember that not only is the Cold War over, the post-Cold War is over. Airmen who started active duty service after the fall of the Soviet Union are now retirement eligible. A generation has passed. That does not mean that strategic deterrence and nuclear forces are anachronisms. What it does mean is that we need to hit fast-forward on how we think about Nuclear Deterrence Operations in the complex security environment of today and tomorrow. The 2010 Joint Operational Environment declared: "For the past 20 years, Americans have largely ignored issues of deterrence and nuclear warfare. We no longer have that luxury." Successful strategic deterrence in the 21st century requires stability-based analysis that goes beyond traditional numbers-based assessments to determine optimal deterrence force structure and posture. The Air Force is revitalizing deterrence thinking to meet the challenges of our complex "multi-nodal" security environment.

CONCLUSION

Our ability to enable other nations to achieve their security goals, serve as a convener to cooperatively address common security challenges, or lastly, act as a security guarantor, preferably with partners and allies, but alone if necessary, rests on a foundation of U.S. nuclear capabilities and the strategic deterrence they provide. Your Air Force is continuing to strengthen our strategic deterrent force. This will be a long-term, systematic effort to refine and solidify earlier "reinvigoration" initiatives and to codify institutional changes ensuring safe, secure, and effective nuclear capabilities for the Nation.

The President's budget request reflects the positive steps we are taking to improve this Air Force core function. Across the FYDP, Air Force investment in Nuclear Deterrence Operations totals $28 billion. The Air Force is committed to ensuring this investment results in systems and capabilities that best operationalize strategic deterrence for our Nation in the multi-nodal security environment we face.

The National Military Strategy acknowledges, "Our Nation's security and prosperity are inseparable" and "Preventing wars is as important as winning them, and far less costly." In this time of limited resources, the efficiency of Nuclear Deterrence Operations is evident in the fact that for approximately 3 percent of the Air Force Total Obligation Authority, your Air Force continues to deliver the bedrock of global strategic stability providing the ICBM and Bomber legs of the Triad as well as dual-capable fighter capability 24 hours a day, 7 days a week, 365 days a year.

Thank you for the committee's continued support of America's Air Force and particularly to its airmen and their contributions to strategic deterrence.

PREPARED STATEMENT BY MAJ. GEN. DAVID J. SCOTT, USAF

Today, the Air Force flies, fights, and wins in air, space, and cyberspace—globally and reliably—as a valued member of our Joint and coalition teams. Last year the Air Force conducted more than 45,000 sorties supporting Operation Iraqi Freedom/New Dawn and almost 101,000 sorties supporting Operation Enduring Freedom. Just recently, the Air Foprce led the way in executing and supporting Operation Od-

yssey Dawn in Libya, flying hundreds of sorties to date. As we continue to accomplish our current mission sets and plan for future threats, we must remain mindful of the increasing age and costs of operating our aging air fleet which is 33.7 years old, on average. Our Air Force leadership is scrutinizing programs and budgets to find acceptable solutions to meet growing demands that are competing for limited funds.

Our fleet of 156 bombers remains engaged in today's fight while retaining an ability to meet future challenges. Air Force bombers have maintained a continuous presence in Southwest Asia since shortly after September 11. Bombers have also provided the U.S. Pacific Commander with a continuous presence throughout the area of responsibility (AOR) since 2004. The Air Force continues its commitment to future long-range strike capabilities as part of a comprehensive, phased plan, valued at $5.5 billion over the Future Years Defense Program (FYDP), to modernize and sustain our bomber force.

B–1

The B–1 currently provides long-range persistent airpower in direct support of NATO/ISAF, U.S. and Afghan troops in three major operations. The B–1 also provides real-time intelligence, surveillance and reconnaissance with full-motion video, enhanced situational awareness and a demonstrable overwatch presence. The Air Force added the SNIPER Advanced Targeting Pod capability to B–1 aircraft in summer 2009 to provide aircrews with positive identification capability and the ability to share video with ground forces. The B–1 has proven to be the workhorse of current combat operations, flying the majority of the bomber combat sorties in the Central Command AOR. Most recently, two B–1s launched from Ellsworth AFB, and dropped munitions in Libya in support of Operation Odyssey Dawn. With less than 2 days from first notice to takeoff, Ellsworth airmen prepared several aircraft and hundreds of weapons to provide the combat configuration needed halfway across the globe. This is the the first time the B–1 fleet has launched combat sorties from the continental United States to strike targets overseas. The B–1 is beginning to show its age and requires multiple upgrades to maintain critical combat capability. B–1 modernization and sustainment programs include the Integated Battle Station program, combining Fully Integrated Data Link (FIDL), Vertical Situational Display Upgrade (VSDU), and Central Integrated Test System (CITS) programs under one installation contract. Four B–1 upgrades are required to prevent grounding of the B–1 fleet. The four grounding modifications are: VSDU, CITS, Radar Maintainability and Improvement Program (RMIP), and the Inertial Navigation System (INS).

B–1 upgrades are a must, but funding has proved challenging. The Air Force has decided that force structure adjustments can provide the necessary cost savings that will allow us to keep the B–1 fleet viable. As such the Air Force is retiring 6, from an overall force of 66, B–1s to fund the 4 grounding modifications plus Fully Integrated Data Link through the remainder of the B–1 fleet. This is strictly a programming action, taking acceptable (moderate) risk to the overall bomber capability requirement. This retirement will not impact current operations because real-world taskings will always take priority over home-station training missions.

B–1 aircraft availability rates remained relatively level for fiscal year 2002–2007 with a drop in fiscal year 2008 and fiscal year 2009 primarily driven by modernization efforts. To mitigate manpower shortages and reduced maintenance experience levels, B–1 bases have been augmented by contract field teams which will continue through April 2011. Manning authorizations have been approved but B–1 aircraft availability will be affected into the distant future while personnel are trained and gain experience. The Air Force places great emphasis on sustaining and maintaining the B–1 fleet, ensuring that this key capability and keeping it available to support our warfighters.

B–2

The B–2 has participated in every combat action, including Odyssey Dawn, since Operation Allied Force and is pivotal to U.S. Strategic Command's plans as well as to U.S. Pacific Command's (PACOM) Continuous Bomber Presence to assure allies and support U.S. interests in the Pacific. The B–2 Spirit provides a lethal combination of range, payload, and stealth. It remains the world's sole long-range, low observable dual-role bomber. It is the only platform capable of delivering 80 independently targeted 500-lb Joint Direct Attack Munitions (GBU–38). It is the only platform capable of carrying the developing Massive Ordnance Penetrator; a weapon crucial to our capabilities against hardened, deeply buried targets. While B–2 availability has steadily increased over the past 5 years, in part due to enhancements

in low observable maintenance such as the highly successful Alternate High Frequency Material program, it faces increasing need for upgrades to avionics originally designed over 20 years ago.

The Extremely High Frequency Satellite Communications and Computer Upgrade Program (EHF SATCOM and Computer Upgrade) has three increments. Increment 1 upgrades the B–2's flight management computers and main data bus as an enabler for future avionics efforts. Increment 2 integrates the Family of Beyond-line-of-sight Terminals (FAB–T) along with a low observable antenna to provide secure, survivable strategic communication, and Increment 3 connects the B–2 into the Global Information Grid. Increment 1 of EHF SATCOM and Computer Upgrade is beginning procurement this year for fleet installations beginning at the end of fiscal year 2013.

We will finish replacing the B–2's original radar antenna, upgrade selected radar avionics and change the radar operating frequency as part of the Radar Modernization Program (RMP). Thanks in large part to Congressional support, the RMP acquisition strategy was modified to include life-of-type component buys to avoid diminishing manufacturing source issues during the production run.

The Department is also investing in B–2 Defensive Management System (DMS) modernization to ensure continued survivability. This will allow the B–2 to continue operations in more advanced threat environments while decreasing the maintenance required to operate the system. The DMS faces obsolescence in light of threat system advances and diminishing manufacturing sources for critical components. $41 million is being invested in fiscal year 2012 with $560 million across the FYDP to maintain B–2 penetration capability. We just completed an Analysis of Alternatives and are preparing to move towards the technology development phase.

B–52

The B–52 Stratofortress is our Nation's oldest frontline long-range strategic bomber with the last airframe entering service in 1962. It amplifies the consistent message of long-range U.S. airpower in a theater like PACOM where distances drive decisions. Equipped with an advanced targeting pod, the B–52 can also provide real-time intelligence, surveillance, and reconnaissance with full-motion video, enhanced situational awareness, a demonstrable overwatch presence and precision joint fires in support of PACOM's objectives. The Air Force has invested in modernization programs to keep the B–52 platform viable and operationally relevant. Major B–52 modernizations include the Combat Network Communications Technology (CONECT), EHF SATCOM, Strategic Radar Replacement (SR2), and the 1760 Internal Weapons Bay Upgrade programs. CONECT provides an integrated communication and mission management system with machine to machine data link interfaces for weapons delivery. The digital infrastructure provided in CONECT is the backbone for EHF SATCOM. The EHF SATCOM program integrates the FAB–T providing assured, survivable two-way strategic command and control communications. The SR2 program, starting in fiscal year 2010, integrates a modern nondevelopmental radar to address systemic sustainment issues, replacing the legacy APN–166 radar. Finally, the 1760 Internal Weapons Bay Upgrade provides internal J-series weapons capability through modification of Common Strategic Rotary Launcher and an upgrade of stores management and offensive avionics software. Updated with modern technology the B–52 will be capable of delivering the full complement of jointly developed weapons and will continue into the 21st century as an important element of our Nation's defenses.

LONG RANGE STRIKE (LRS)

Our existing bomber force has performed exceptionally well and has provided our Nation an unmatched global strike capability. However, these systems will eventually reach the end of their service lives. Our bomber fleet also faces challenges in the face of advancing threat capabilities and emerging Anti Access/Area Denied (A2/AD) environments. The Air Force must look ahead to the next generation of long range strike capability in order to provide future presidents the ability to hold any target at risk, anywhere on the globe.

On January 6, 2011 the Secretary of Defense announced that the Air Force would initiate a new bomber program as the cornerstone of the future of our Long Range Strike portfolio for the United States Air Force. Our intent is to field a new long-range penetrating bomber to join the joint portfolio of deep-strike capabilities. He directed this new penetrating bomber would be nuclear capable, and envisioned to accommodate both unmanned and manned operations. The SecDef also directed the Air Force to procure 80–100 of these new highly survivable bombers, which should begin delivery in the mid-2020s. The fiscal year 2012 President's budget provides

funding for the long range penetrating bomber program, following an extensive 18 month, OSD-led review of long range strike requirements. By leveraging proven technologies and streamlining program management during development, the Air Force will ensure the new bomber can be delivered before our current fleet goes out of service. Though details of the program, including specific system performance attributes such as range, payload and speed are classified, the total annual budget will be executed by regular appropriation of funds, with the Air Force making capability tradeoffs as necessary to hold procurement costs down to ensure affordability for the full purchase of the program of record. The President's budget requests $197 million in fiscal year 2012 and $3.7 billion over the FYDP for the new penetrating bomber.

In the mid-term (2017–2030), we plan to field the new penetrating bomber while continuing to develop its capability as the threat and the technology mature. Long-term (2031–2050) plans aim to complete fielding of the fleet while continuing to evolve the weapon system as the threat environment and technology mature. The Air Force LRS strategy provides present and future leaders continued and affordable global strike options within emerging anti-access area denial environments.

CLOSING

The Air Force stands ready to win today's joint fight and plan for tomorrow's challenges. We are committed to working together to determine the right procurement, sustainment and retirement strategy to remain prepared for the current fight as well as posturing for future demands. Dominance of air, space, and cyberspace continues to be requisite to the defense of the United States. We appreciate your continued support and look forward to working in concert to ensure our decisions enable us to strengthen our Air Force to meet future requirements.

PREPARED STATEMENT BY BRIG. GEN. GARRETT HARENCAK, USAF

Chairman Nelson, Senator Sessions, and distinguished members of the Strategic Forces Subcommittee thank you for this opportunity to discuss our continuing improvements to the Air Force's nuclear sustainment efforts. As a result of the dedication of our talented team of military personnel, civilians and industry professionals, I can attest that the Air Force nuclear enterprise is considerably stronger today than at any point prior to the Nuclear Weapon Center's establishment in 2006. The vitality that we see today represents a reversal in a decades-long de-emphasis of America's strategic forces that was first documented in studies ranging back to 1998. In the years that followed, a series of reports called for a single manager for nuclear weapons sustainment, a consolidation of management sustainment activity and a unified funding strategy. In response to these reports, Air Force Materiel Command (AFMC) developed a two-phase strategy to establish a new center responsible for nuclear sustainment activities. The first phase was completed in March 2006 when the Nuclear Weapons Center was activated. AFMC and the Center then began the lengthy task of pulling together the fragmented pieces of the Air Force nuclear enterprise. Phase II was accomplished in April and May 2008 with the assignment of the first flag-level officer as Center commander and the assignment of the Intercontinental Ballistic Missile (ICBM) Systems Program Office to the Center. Phase III began in February 2009 with the signing of Program Action Directive (PAD) 08–05 which directed further integration of the enterprise.

I am pleased to tell you that on January 20, 2011, General Hoffman, the AFMC Commander declared that the Air Force Nuclear Weapons Center had achieved Full Operational Capability (FOC). This is a measure of General Hoffman's confidence that AFNWC has successfully created and codified staff best practices and standards, that we are sufficiently capable of advocating for the resources necessary to execute our plans, that our staff is sufficiently manned and capable and that we have put in places processes and procedures that are measurable, repeatable and auditable, all contributing to our primary mission: support for the warfighter.

Most assuredly, this does not represent any sort of watershed moment in the strengthening of the nuclear enterprise . . . the pursuit of the nuclear zero defect culture requires continuous improvement and oversight and we still have a long way to go to get to where we want to be. The declaration of FOC does, rather, show how far we have come in applying common-sense leadership and organizational principles to a difficult problem. There can be no letting up, however, on tracking down and eliminating remaining problems that confront the enterprise. We will continue to perform self-assessments, independent inspections and progress reviews to ensure that focus is maintained on critical factors that define the health of our strategic

deterrent. The Nation will not tolerate any less of the stewards of the Air Force's most potent weapons.

In addition to the completion of Phase III of AFNWC's standup and declaration of FOC, AFMC and the Air Force as a whole have made significant strides in reorganization that have reinvigorated and strengthened the nuclear sustainment enterprise. The Air Force vested the AFMC Commander as the single four-star officer responsible for nuclear sustainment. It is important to note that since the inactivation of Strategic Air Command in 1992, no single four-star officer had been charged with understanding and articulating the needs of the Air Force with regard to nuclear sustainment below the Chief of Staff. In contrast, today the Air Force has a one-star officer overseeing the day-to-day sustainment issues of the enterprise, while a four-star officer keeps the Secretary of the Air Force, the Chief of Staff, and the Commander of Air Force Global Strike Command informed and engaged in issues involving the sustainment of nuclear weapons and the health of the various delivery vehicles and pieces of support equipment which comprise the Air Force strategic deterrent. A series of recurring reviews, culminating in the Nuclear Oversight Board, chaired by the Secretary and Chief of Staff and comprising all Major Command (MAJCOM) commanders ensure high-level oversight of trends, developments and attention to emergent issues. Additionally, AFMC created a new directorate specifically focused on nuclear matters and tasked with representing the Command to other MAJCOMs, the Air Staff and the Joint warfighter.

As members of the subcommittee are well aware, a number of studies were conducted in the wake of the 2007 and 2008 incidents that brought the shortcomings of the Air Force nuclear enterprise into the public eye. While the studies revealed a large number of discrete process failings, organizational issues, and leadership problems, in the macro sense, they all bore out the same root cause: that the focus on standards had atrophied over the years and that this root cause ended up manifesting itself in three serious "seams" that had to be addressed immediately. These seams are: (1) a lack of nuclear expertise; (2) a lack of nuclear focus; and (3) a lack of authority. These seams "opened" under the weight of competing priorities and the stress of continuous combat operations since 1991. AFNWC has been working with its numerous mission partners to close these seams by making thoughtful and deliberate changes to the way in which things get done in the nuclear enterprise.

There are three overarching ways in which we as a center are working these problems. The first is by enabling collaborative partnerships. We realized from the very beginning that, given the large number of players in the nuclear arena, we simply cannot have a stovepiped view of the enterprise. From other Air Force agencies, such as the Air Staff's nuclear directorate, AFMC's nuclear directorate, Air Force Global Strike Command, other centers and commands, and the joint warfighter, to other government organizations such as the National Nuclear Security Administration and beyond to colleges, universities, and national laboratories, AFNWC has been working hard cultivating contacts and associates. By doing this, we're ensuring that we can meet requirements more rapidly, find answers and recruit the right people to get the job done for the warfighter and the Nation. One of our most vital collaborations is with the newly created office of the Program Executive Officer (PEO) for Strategic Systems. The PEO position was created in response to specific recommendations made by the Schlesinger Report, and has assumed responsibility for the development and acquisition of future systems and for modernization efforts while AFNWC focuses on day-to-day operations and sustainment. The PEO, Brigadier General John Thompson, who reports to the Air Force Service Acquisition Executive, Mr. David Van Buren, is colocated with AFNWC at Kirtland Air Force Base, NM.

The second way we're sealing the seams is by improving our ability to spot problems and come up with solutions before they become crises. As our nuclear stockpile ages, it is becoming apparent that any number of serious problems may be waiting around the corner. By using sound engineering principles, we are becoming increasingly able to spot trends with weapons, delivery systems and their associated support equipment and determine practical, effective and timely solutions before the problem reaches a critical stage, at which point they become difficult and expensive to address. Like other complex systems, our nuclear arsenal is dependent upon a vast number of components and processes, the failure of any one of which can be very serious for a given weapon system. Many of these components have not been updated in decades and, while expertly maintained, are not immune to deterioration. As former U.S. Strategic Command (STRATCOM) Commander, General Kevin Chilton stated in 2008, nuclear weapons, even when sitting on the shelf, are chemistry experiments. They are constantly changing from chemical reactions inside of them. This extends as well to other equipment as well, some of which is affected by wear and tear on top of everything else. Metal fatigue, corrosion and chemical

changes all take their toll. If a weapon, delivery system or a piece of support equipment only had to last to the end of its 10-year design life before replacement, like much of our equipment was intended to have, it wouldn't be as crucial that all these very long term issues be taken into account. However, if we extend this to the 30, 40, or 50 year lives we now expect from our current weapons, it becomes vitally important that we understand the relationship between the various components and use sound engineering practices to determine the correct course of action to maintain reliability and availability for the warfighter.

The third way we're closing the seams is by deliberately maintaining a forward-looking view, both in order to be proactive to possible problems on the horizon and to ensure that nuclear sustainment equities are thoroughly considered in the planning and development of future systems. AFNWC is heavily involved in the Long-Range Standoff Analysis of Alternatives (AoA) process and is helping lay the groundwork for the forthcoming Ground Based Strategic Deterrence AoA. We are also working with the PEO for Strategic Systems on acquisition and modernization programs for the various systems which make up our strategic deterrence force. We are looking to the future in other ways as well, reaching out to universities and national laboratories to recruit new talent, helping to rebuild the nuclear expertise that has been lost in the years of atrophy. Finally, AFNWC is involved in ensuring that adequate qualified military personnel are available to perform the difficult task of maintaining the arsenal and that they have available the necessary equipment and tools to do their job.

I am a strong advocate of keeping a big picture, strategic view. With so many discrete tasks requiring attention, this is sometimes difficult. However, it is vital that our perspective be kept broad and that we always question what effect changes will have on the health of the force. As we have found in the past, there are often second- and third-order effects that can result from decisions we make now. Decisions such as how reductions for the New START treaty are executed, for instance, will have long-term repercussions, for good or ill that will continue for decades. We are committed to providing thoughtful solutions and advice based on sound engineering and logistical principles and always moving no faster what we have termed "the speed of nuclear surety."

AFNWC's most important mission is to provide direct support for the warfighter, in this case, STRATCOM. To that end, as part of Phase III of AFNWC's stand-up, we assumed command of the Air Force's remaining five CONUS Weapons Storage Areas (WSAs)—which had previously been split between three commands—AFMC, AFSPC, and Air Combat Command (ACC). This was done with the goal of standardizing publications, procedures and leadership in mind. In addition to this, we created a Directorate of Nuclear Surety within AFNWC to work with the WSAs as a coherent and integral weapon system. This Directorate recently published a detailed study of the Air Force WSAs, further pointing out their need for standardization across civil engineering, communications, security and safety disciplines. The Nuclear Surety Directorate has also brought together WSA stakeholders from across the Air Force and Navy in recurring council sessions to deliberately work through requirements and to better advocate for needed modernization and upgrades.

In addition to WSAs at CONUS bases, the Air Force Nuclear Weapon Center responsibilities include direct support to force providers in Europe—the U.S. Air Forces, Europe (USAFE). We manage programs for support equipment sustainment in the European Theater, including weapons storage vaults and the weapons maintenance truck, both of which are vital to the safety, security, and sustainment of the B61. Additionally, we are working closely with the AFPEO for Strategic Systems on life extension modifications to the B61 to ensure that it continues to meet the requirements of USAFE and our NATO allies.

Furthermore, to ensure that the Air Force's ICBM force remains robust and capable through 2030, as required in the National Defense Authorization Act for Fiscal Year 2007, we are currently undertaking a number of critical actions to sustain today's aging forces. First among these is a two-pronged approach to providing sufficient Mk21 fuzes to support the warfighter. We have instituted an aggressive screening program to identify fuzes requiring few or no repairs. Those which pass the screening are returned to the field for installation into the Safety Enhanced Reentry Vehicle modified Minuteman III ICBMs. Those failing the screening tests become candidates for refurbishment. Initial attempts in 2008 to refurbish Mk21 fuzes were unsuccessful, in large part due to their level of sophistication and complexity. Our two-pronged approach to refurbishment has enlisted the assistance of the original manufacturer, which has been successful in demonstrating its ability to refurbish the fuze. Additionally, an organic production line at Hill Air Force Base is in the process of performing its proof-of-concept trials and will begin fielding refurbished fuzes in fiscal year 2012. Along with the screening process, these two produc-

tion lines, operating simultaneously, will be able to provide enough operational Mk21 fuzes to meet initial warfighter requirements in the mid-term. We are also working closely with our mission partners at Ogden Air Logistics Center which is currently completing their first refurbishment cycle for the Mk12A fuze. This refurbishment effort is on schedule and meeting production goals. AFNWC is also working with AFGSC and the NNSA to ensure that they have our full support in the field of testing. By bringing on board a dedicated Center Test Authority (CTA), we are not only ensuring that there will be no surprises related to ICBM test supportability, but we are also looking to the future to ensure that testing requirements are included in AoAs and studies for follow-on systems. The value of the CTA had been validated by recent cooperative work between the ICBM Systems Division, AFGSC and the ICBM Prime Contractor on emergent issues with the Minuteman III Command Destruct system. Finally, we are working closely with the PEO/SS on requirements and considerations for a joint fuze, which is envisioned as a replacement for both the Navy Mk5 fuze and the Air Force Mk12A fuze, with the goal of realizing benefits in standardization, functionality and cost.

As I mentioned previously, possibly our greatest challenge is with our most important asset—our people. From where we are right now, we can see that we are far from healthy with regard to our pool of available talent. Years of atrophy have reduced the overall number of nuclear-experienced personnel available, and the recent reinvigoration of the nuclear enterprise has made competition for the scarce talent severe. Additionally, the available personnel are tending to be toward the top and bottom of the demographics. We have a number of experienced senior level personnel and the Air Force is doing a good job bringing in inexperienced but enthusiastic junior people, but we currently lack the strong mid-career professionals, both military and civilian, who are the backbone of a successful organization. While time and experience will resolve this problem eventually, the Air Force has embarked on an aggressive program to identify its nuclear experienced personnel and to ensure that they are tracked and placed appropriately to make the best use of their experience. Furthermore, AFNWC has created the Air Force Nuclear Fundamentals Course, which encompasses nuclear weapons fundamentals, force structure, nuclear stockpile guidance and planning, nuclear surety and the nuclear enterprise. We are also working with the Air Staff and Air Force Personnel Center to rebuild a strong, well-managed nuclear science and engineering workforce. We're trying to ensure that our people receive everything they need in order to thrive in the difficult nuclear environment, including a solid organization with strong, repeatable processes, training, education and meaningful experience as well as the necessary support equipment and processes to do the job.

In closing, I would like to emphasize the hard work and dedication of AFNWC's professionals and their efforts to address the most pressing concerns in the nuclear enterprise. The American public rightly holds its nuclear stewards to the very highest standards, and we will not let them down. I would like to thank the committee for the opportunity to address these issues and look forward to your questions.

Senator NELSON. Thank you, General. Thank you all. We'll commence a 6-minute round of questions.

General Kowalski and General Scott, the B–1 and B–2 bombers each flew in Operation Odyssey Dawn in Libya. What is your assessment of the mission success of each of these bombers and did either have any equipment or other problems?

General KOWALSKI. Chairman Nelson, the bombers and their weapons performed exactly as we expected them to. The crew members' performance was superb, and the command and control of the operation also was executed very well from organizations within the U.S.

Senator NELSON. General Scott, anything to add?

General SCOTT. Sir, I would just add that if you looked at the B–1, for the first time in history they flew from the States to a target in another nation and then returned, not back to the States, but to a point in space. So they flew a 24-hour sortie. If you remember that particular day where they were launching those aircraft 42 hours after they got notified, it was in the snow and ice. Those were some pretty tough conditions for our young men and women

loading those aircraft up and getting them airborne to do the mission that they did. Sir, it was absolutely flawless.

Senator NELSON. Thank you.

Also, to the two of you, the last time the longevity of the current fleet was reviewed, all the bombers would begin to start retirement around 2035 to 2037. Can you tell us now, what is the expected retirement date for the B–52, the B–1, and B–2 based on current expectations and current projections?

General KOWALSKI. All of those bombers, based on longevity in terms of the aging and surveillance information that we get on the airframes as they go through depot and other studies, have them all going out past 2040. The limiting factor on the B–2s is the rudder attachment point right now. The limiting factor on the B–52s is the upper skin of the wing, and on the B–1s it's the lower skin on the wing.

General SCOTT. That's absolutely right. In the B–1 fleet, we have it from right now structurally out to 19,900 hours. That takes it out to the '40s. If we also look at it, by 2018 we will be doing a fleet viability board and a structural test on it to see where we need to go further with that aircraft.

Senator NELSON. Now, continuing with this, all of the current bomber aircraft have modernization programs of varying types to try to reach that 2040 point in time. Do we have a comprehensive plan developed for each bomber aircraft that would help us understand what it's going to take to sustain and modernize each bomber so that we can be certain that each platform remains capable through that period of time? Is there an overall program for each one of the birds?

General KOWALSKI. Senator, for both the B–2 and the B–52 there are existing roadmaps. With the standup of Air Force Global Strike Command, we have put into place a larger strategic master plan to sort of guide our efforts from our mission and vision all the way down to specific tasks to be done during any current year. We're in the process right now of integrating the roadmaps for the B–2 and the B–52 into that strategic master plan so we can track it and work tasks on a regular basis.

Senator NELSON. General Scott, several of the upgrade programs are needed to prevent the bombers from being grounded. For example, the B–1 had three programs that had to be in place this year to prevent grounding. These three programs are the central integrated test system, the vertical situation display, and the radar modernization improvement program. Are all the programs that I've just outlined on track to complete by the end of the year to avoid having any grounding?

General SCOTT. Sir, they are on track. The end of the year is not the timeline. The actual timelines are for these specifically, are in 2012 and 2013. But the funding is in place for the B–1 to do this. As we look at this, we look at it in four different ways: the sustainability, lethality, responsiveness, and the survivability. That's how we tie the things that the Air Combat Command (ACC) is working on to maintain this modernization of this fleet.

They are on track, but the timelines are in second quarter of 2012 and 2013.

Senator NELSON. General Kowalski, the Global Strike Command is now fully operational. Are there any plans to move the B–1 to Global Strike?

General KOWALSKI. Senator, I'm not aware of any plans at this time.

Senator NELSON. Is anybody else aware of any plans to do that?

General CHAMBERS. No, Mr. Chairman.

Senator NELSON. General Scott, in the fiscal year 2012 budget request the Air Force has proposed to retire six B–1 bombers. Could you explain why these bombers are being retired and what are the cost savings associated with the retirements?

General SCOTT. Mr. Chairman, as we look at our fleet and as we look at the entire bomber fleet, we look at how we can balance and manage capability and capacity. As we look at the modernization pieces that we're doing with the B–1 and as we look at these specific aircraft, the six that we're reducing, we're not retiring the fleet; we're reducing the number that we are. It's to enable us to be able to take those 60 aircraft, continue that modernization on time to maintain that combat capability that we give to the COCOM commanders.

Senator NELSON. Do you think that the 60 will be sufficient for that by reducing it by 6, or will we be shorting ourselves of our capabilities for cost savings?

General SCOTT. Sir, the analysis that we have done looking at all of the force planning structure and the analytical agendas that we have been given show that the 60 will be—with, again, as you look across the fleet of the bombers and the combat air forces, working with Global Strike Command and ACC—yes, sir, the total number of bombers is still well within the capability of the risks that we accept.

Senator NELSON. Thank you.

General SCOTT. Yes, sir.

Senator NELSON. Senator Sessions.

Senator SESSIONS. Thank you.

I'll submit some questions to each of you concerning the modernization of our strategic deterrent and the cost. I know you're wrestling with that and I'd like to have as much information as we can as we wrestle with it. I happen to be the ranking member on the Budget Committee, which makes all this no fun to talk about.

Let me ask, Admiral Benedict, about the solid rocket motor industrial base. Or maybe General Kowalski mentioned that earlier. The fiscal year 2012 budget shows an almost 85 percent per unit increase, Mr. Chairman, $8.5 million more than the cost for the same motors in 2011, for the purchase of the D5 solid rocket motors. How much of that price is related to the cancellation of the Constellation and lack of NASA's decision to have a clear path for heavy lift, and what can be done about that if that's the problem?

Admiral BENEDICT. Yes, sir. We have seen the unit cost increase from approximately $10.7 million to approximately $19.2 million. Of that, part of it is due to overhead increases. We calculate motor costs to be about 60 percent of that increase. The other 40 percent is due to requalification, material increases, and the retooling in order to continue production of the original D5 design.

We have worked very closely with Lockheed Martin and Alliant Techsystems Inc. (ATK), our industry partners, to try and mitigate the cost of the uncertainty and the cancellation in the NASA programs. We have seen ATK reduce their indirect overhead by approximately 24 percent. We have seen ATK reduce their current work force by approximately 42 percent.

In parallel with that, we have taken significant process and quality improvements. We estimate savings of about 17,000 man-hours or about $10 million a year cost avoidance.

So as we look at this issue today, we have a requirement to STRATCOM to continue to provide the survivable strategic deterrent. We are the only program today in current production. So we are working very closely with the industry partners as they try to develop not only a business plan, but understand the larger plan for this national capability solid rocket motor industry.

Senator SESSIONS. Do I understand that the decline in numbers of purchases driven by NASA's situation has increased the cost? What part of the cost increase do you attribute to that?

Admiral BENEDICT. Yes, sir. If you look at it in just terms of pure volume, NASA is about 70-plus percent of the solid rocket motor industry. We're about 20 percent. Another baseline point is it would take 10 Trident motors—first, second, and third stages—in order to make one solid rocket motor booster for the Shuttle. So in pure volume, the NASA decision is one that causes the overhead to be spread amongst the remaining programs.

We have worked closely with the Air Force. Their Minuteman program is in a smart shutdown. The NASA program is significantly ramped down. We are the only strategic program of solid rocket motors that are currently in production, so we are currently bearing that overhead shift.

Senator SESSIONS. Well, we've tried to work on that because I think NASA needs to maintain its role, and through our budget and other reasons we haven't been able to do that. It's had the perverse result of driving up DOD's costs.

General Kowalski and General Chambers, as I mentioned in my opening remarks, the 1251 report that accompanied the New START treaty stated that the administration intends to begin to study a follow-on ICBM in a way that "supports continued reductions in U.S. nuclear weapons." Can you elaborate and provide some context for that statement? Do you know precisely what was being referred to there?

General KOWALSKI. Senator, I'm not sure what's being referred to there. In terms of the ground-based strategic deterrent, our command is working with headquarters Air Force on a capabilities-based assessment and we plan to move to pre-ICD activities next year.

Senator SESSIONS. "ICD" is?

General KOWALSKI. Initial capabilities document, and analysis of alternatives by fiscal year 2013.

Senator SESSIONS. Well, could this guidance that you conduct this review for the follow-on ICBM in a way that supports continued reductions in U.S. nuclear weapons—is it possible that such a statement could influence the results that you produce, the nature

of the study? Have you been directed to consider that as you make your study?

General KOWALSKI. Senator, the guidance we have right now is in the nuclear posture report and that's the guidance that we're using for the capability-based assessment.

Senator SESSIONS. General Chambers?

General CHAMBERS. Yes, sir. The exact context of that wording is unclear. However, the section 1251 report does indicate, of course, that the ground-based leg of the triad the Air Force will retain up to 420 ICBMs from a current force of 450. So the "up to 420" is the baseline for the New START level of ICBMs, and so the follow-on ICBM uses that as the starting point.

Now, if further policy looks are made at further reductions, we are not yet tasked to go any further than that. So the "up to 420" is our guiding baseline right now.

Senator SESSIONS. The problem I want to know is that, here we have the report suggesting that anything you say, anything you conclude, should support continued reductions. Are you prepared to issue a report if you so decide that does not recommend reductions? It seems like to me otherwise you're having a political interference or a political override of military best judgment.

General KOWALSKI. The efforts that we're pursuing right now in ground-based strategic deterrence won't address the policies. It will simply address what we see as the capability requirements based on the 2010 nuke posture review.

Senator SESSIONS. General Chambers?

General CHAMBERS. Yes, sir. As General Kowalski indicated, the entire material solution analysis phase for this new—for this potential Minuteman follow-on, will continue into fiscal year 2014. Between now and fiscal year 2014, if there are national policy decisions made with regard to force structure, I know I'm very confident that my chief of staff will be involved in providing military advice to those discussions. But they will certainly inform the final force structure number. But right now we're starting this study effort with a baseline of up to 420.

Senator SESSIONS. Well, ultimately the political leaders make final decisions on the matter, there's no doubt about it. But I would trust that all of you—and I guess I'll ask you to state for the record: Do all of you understand it would be your duty, if asked in hearings or within DOD, that your duty would be to give your best military judgment as to how to best defend America, even if it's not in accord with us politicians? General Scott?

General SCOTT. Yes, sir.

Senator SESSIONS. Admiral Benedict?

Admiral BENEDICT. Yes, sir.

Senator SESSIONS. General Kowalski?

General KOWALSKI. Yes, sir.

Senator SESSIONS. General Chambers?

General CHAMBERS. Most definitely, sir.

Senator SESSIONS. Well, I just wanted to raise that, because sometimes, even in the military, cultures and climates get established and people feel like they should try to make their judgment comply with what higher officials would like to see. But this is so

important and so critical, and I appreciate your willingness to speak the truth as you see it.

Senator NELSON. Thank you.

To comply with the New START treaty, the Air Force will draw down the number of nuclear-capable bombers, as has been discussed, the number of deployed Minuteman III ICBMs, and the Navy will reduce the number of deployed D5 SLBMs. Let's start with the bombers. General Scott, the B–1 became a conventional-only bomber over a decade ago. Nevertheless, they were counted under the old START Treaty. Do we know when the efforts will begin to modify all the B–1 aircraft so that they're not nuclear-capable any more under the new treaty?

General SCOTT. Mr. Chairman, I'll start with the answer but then I'll pass it to General Chambers as the guy that works the treaty.

Under the old START treaty, all of the B–1s, I think as of about a week ago, General Chambers will say, have been retrofitted non-nuclear. So under old START they are non-nuclear. Now, there are some timelines on when we notify the Russians, and again I'll let General Chambers follow on with that, for the New START inspection process. But currently today the B–1s are conventional platforms.

Senator NELSON. Great.

General Chambers?

General CHAMBERS. Mr. Chairman, one of the first provisions of the new treaty was to provide the Russian Federation an exhibition of a B–1. That has now been completed in compliance with the treaty, and that was the last hurdle to converting the last B–1. So the entire B–1 fleet has now either been converted or eliminated, and thus the Russian Federation now has 60 days to confirm that using inspection means. Then some time late this summer, early fall, the database for New START will no longer reflect B–1s as an accountable nuclear delivery platform.

Senator NELSON. It's my understanding, General Kowalski, that all the B–2 aircraft will remain nuclear-capable. Is that accurate?

General KOWALSKI. Mr. Chairman, yes, that's accurate.

Senator NELSON. Has there been any decision as to how many B–52s will be modified to no longer be nuclear-capable?

General KOWALSKI. Mr. Chairman, that conversation is ongoing. We expect a decision will be made soon on the force structure options.

Senator NELSON. Has there been a decision as to the actual modification that will be needed to remove the B–52 from being counted as a nuclear-capable bomber under that New START treaty?

General KOWALSKI. No, that decision has not been made yet.

Senator NELSON. Do we have some idea when it may be made?

General KOWALSKI. I'd turn that over to General Chambers.

General CHAMBERS. Mr. Chairman, the conversion method for the bomber, for the B–52, has to be reviewed by a body called the Compliance Review Group. It's a bilateral group of Russians and American specialists. That Compliance Review Group will meet later this spring, I believe in the month of May, but we can check that for sure.

The command has given their method of converting and that method will be reviewed, and we hope to get a good answer soon.

Senator NELSON. Okay. If you would, for the record respond to us with that information when it's available.

[The information referred to follows:]

When is the next CRG to discuss bomber conversion method? How long will it take for a decision? What's the CRG membership?

(1) Date of the next Compliance Review Group (CRG): CRGs do not meet regularly; rather they convene in reaction to Services (or DOD Agencies) bringing forward proposed activities that raise issues of compliance with arms control treaties. For B–52 conversion, the Air Force's aim is to meet the Treaty's requirement to render the converted bombers incapable of employing nuclear armaments while simultaneously preserving full conventional functionality. We have found that the more due diligence we conduct before approaching the CRG, the more rapidly they can reach compliance decisions. With this in mind, the Air Force is currently fleshing out a proposal for converting some number of operational B–52Hs to a non-nuclear role. We currently envision approaching the CRG with a thoroughly developed package within the next couple of months.

(2) How long will it take: Engaging the Compliance Review Group marks the beginning of the process leading to a compliance decision. Experience reveals that the decision process can sometimes be an iterative one. We have seen some issues settled in a matter of weeks to months while in some rare cases others have taken years. As a result, it can be difficult to predict the point where a decision will be made.

(3) CRG membership: The Under Secretary of Defense for Acquisition Technology and Logistics is the DOD official responsible for ensuring that DOD activities are conducted in compliance with treaties. The Under Secretary is supported by Compliance Review Groups—one for each treaty. The individual membership may change from treaty to treaty. However, the organizational composition remains the same—senior-level experts from OSD (Policy), OSD (General Counsel), the Joint Staff, and is chaired by OSD(AT&L).

Senator NELSON. Admiral Benedict, my understanding is that the Navy will retain the current number of *Ohio*-class ballistic missile submarines under the New START treaty, and that's 14, but will remove missiles from the missile compartment of the deployed submarines. Each submarine can carry 24 missiles. How many D5 missiles will be removed from each deployed submarine, and will this process start soon and how long might it take?

Admiral BENEDICT. Yes, sir. The Navy's current planning is to remove four missiles per deployed submarine, so we would go from 24 to 20. We are currently programmed to do that beginning in fiscal year 2015, and we expect that to be accomplished within a 2-year timeframe.

Senator NELSON. General Kowalski, the Air Force plan is to reduce to approximately 400 deployed Minuteman III ICBMs from the current 450, and my understanding is that each squadron of 50 missiles is interdependent, but the Air Force is exploring options as to how to reduce the number of ICBMs. In other words, will a whole squadron be deactivated or will the Air Force pick and choose among missiles and among the squadrons?

General KOWALSKI. Mr. Chairman, the force structure options will be determined soon in terms of the Chief and the Secretary looking, reviewing them, and then making their recommendations back to the Secretary of Defense.

Senator NELSON. Because there's some sort interdependence, is it going to be possible to take out of the various different locations maybe one or two, or do you have to remove an entire set at once?

General KOWALSKI. The options that we're looking at—as we put forward the 1251 report, if you do the math on that you see that we end up with about 720. So there's about 20 strategic delivery vehicles that we're trying to get—trying to get our arms around in terms of how we get from 720 to 700. So whether that 20 is bombers or whether that 20 is missiles to go from 420 down to 400 is what we're wrestling with right now.

Once we determine what is the best way to get there, then there's a follow-on discussion of that. For example, if we do decide that it is to go to 400 on the ICBMs, then the decision then is do you spread that out among the force? We have 45 flights of 10 missiles out there in the field right now, so if you took one from each that would get you to about 45. Or whether you pursue an entire squadron. There are pros and cons to both, and that will inform the decision as we go forward here in the next few weeks.

Senator NELSON. Thank you.

Senator Sessions.

Senator SESSIONS. With regard to the solid rocket motors, has there been a consideration, Admiral Benedict, of working with NASA to try to achieve a reduction in cost per unit as a result of more numbers?

Admiral BENEDICT. Yes, sir. I met with the director of NASA's Huntsville location just last Friday. We have been very collaborative with NASA, MDA, and other Office of the Secretary of Defense (OSD) groups. OSD industrial policy led the review in response to the congressional direction for a report on the future of the solid rocket motor industry.

My understanding as of this morning, that report has been approved by Dr. Carter and will be released. We provided an interim report last summer on what we believed within the Department was the proper path forward for the solid rocket motor. The final was just signed this morning, sir. So we have been working very collaboratively with all the other solid rocket motor users.

Senator SESSIONS. Thank you.

General Chambers, can you tell us about the current status of the dual-capable, nuclear-capable variant of the F–35? Is it scheduled for the 2017 delivery date still?

General CHAMBERS. Senator Sessions, the F–35 as a platform, of course, is part of the larger F–35 program both for the United States and the allies. That program overall is now undergoing a technical baseline review. That technical baseline review will later this summer and fall probably give us a new timeline. The timeline for production and delivery of the F–35 is going to slip to the right. The amount of time is unknown, but that will impact the delivery of that capability with the new B61 life extended—B61 Mod 12, to the alliance in Europe.

Thoroughgoing planning is under way to cover any potential gap that this slip may require. Sir, the current mission is being fulfilled by F–16s and F–15Es stationed in Europe. Those units that conduct that mission continue to conduct it, continue fully certified to conduct it. Some portion of those airplanes will continue to perform the mission until the F–35 is ready and fully integrated and deployed to Europe.

Senator SESSIONS. Are you not prepared to give us a date of the F–35?

General CHAMBERS. Yes, sir. The F–35 Joint Program Office, of course, is working this very hard, and we just know that, writ large, the F–35 program is approximating a 2-year slip. That doesn't mean that every piece of F–35 capability is going to slip to the right 2 years. So we are also very confident that the piece of that F–35 development program which calls for it to carry a nuclear weapon is still the first block of software after the development phase, which is a good thing. But the exact date I can't name yet.

Senator SESSIONS. Admiral Benedict, according to recent press reports the Navy rejected the recommendations of STRATCOM to design the next generation of ballistic missile submarines with 20 missile tubes instead of opting for only 16 per boat. What is the basis for the Navy's decision of 16? I'm sure cost is a factor. In what ways will that decision impact overall nuclear force structure associated with the command?

Admiral BENEDICT. Yes, sir. SSP supported the Navy analysis, STRATCOM's analysis, as well as the OSD analysis as we proceeded forward and towards the Milestone A decision that Dr. Carter conducted based on our input, which was the technical input, as the Director of SSP. Other factors were considered. As you stated, cost was one of them.

But as the Secretary, as the CNO, and I think as General Kehler submitted in their testimony, given the threats that we see today, given the mission that we see today, given the upload capability of the D5, and given the environment as they saw today, all three of those leaders were comfortable with the decision to proceed forward with 16 tubes, sir.

Senator SESSIONS. Does that represent your judgment? To what extent were you involved in that?

Admiral BENEDICT. Sir, we were involved from a technical aspect in terms of the capability of the missile itself, what we can throw, our range, our capability. Based on what we understand the capability of the D5 today, which will be the baseline missile for the *Ohio* Replacement Program, as the Director of SSP I'm comfortable with that decision.

Senator SESSIONS. Thank you, Mr. Chairman.

Senator NELSON. General Harencak, you have recently assumed command of the Nuclear Weapons Center, another organization established to address the problems with the nuclear enterprise, particularly the incident where a missile nose cone was mistakenly shipped to Taiwan mismarked as a battery. I have two or three questions that I'd like to ask.

Do you think you have positive control over all nuclear-related parts?

General HARENCAK. Absolutely, sir. We've made significant progress over the years in developing positive inventory control (PIC) and merging of databases, and we are absolutely positive that we have fixed that problem.

Senator NELSON. Could you describe what kind of a database you've put together to make sure that all the parts are accounted for, incoming, outgoing, and in supply?

General HARENCAK. What we've developed is what we call PIC fusion. What it does is, it merges all of the databases into one. We take in-transit databases. We take databases that are in base supply, any type of database that may be even indirectly under our control or not. For example, we're right now beginning to merge the nuclear weapons-related material (NWRM), that is ours, that the Department of Energy currently holds for us at Pantex and the Kansas City plant, for example. So we've merged this. It's been under development. It's a constantly evolving system that gives us very, very solid visibility on where all this is.

I might also add that when it comes to actually the nuclear weapons themselves, there is one general in the Air Force that knows at all times where every weapon is, whether it be in storage or in transit, and that is me. We do that through our Sustainment and Integration Center (SIC), which is headquartered at my headquarters in Albuquerque. It has complete control and focus on where everything is.

Senator NELSON. Much of the maintenance and test equipment supporting the missiles and the nuclear weapons is old and needs to be replaced. Now that we have knowledge of where everything is, do you have any plans to begin replacing the old equipment?

General HARENCAK. Absolutely, sir. We have spent and plan on spending almost $1 billion from 2009 to 2016 on specifically ensuring the capabilities are retained through refurbishment and repair and getting ahead of the systems. For example, the reentry system test tabs, which are cables that have to be repaired. We're getting out ahead of them. While we're refurbishing, while we're fixing these and getting them out to the field as quick as possible, we're also fast-tracking the designing and building of replacements.

So we are very focused on keeping a whole weapons system, specifically the Minuteman III, viable through a focused sustainment life cycle cradle-to-grave approach.

Senator NELSON. Thank you.

General Kowalski, much of the support equipment for the missiles, it's very old. What are your plans to address the issue of aging equipment, including, for example, the need to replace the Vietnam-era helicopters that support the missile fields? Are there new helicopters needed, and if so why, and can the Air Force replace these helicopters with very little, minimal, or no development costs?

General KOWALSKI. Mr. Chairman, we're working with the system program offices and with the Nuke Weapons Center on a lot of the test equipment issues for the ICBM. We also have a missile engineering squadron that's currently based at Peterson Air Force Base, that does a lot of the facility kinds of sustainment for it.

On the requirements for the helicopters, when the UH–1 was introduced it was introduced primarily as a lift platform for support. It really wasn't identified as part of the security. When we did a series of stressing reviews of the security requirements of the missile fields, what was identified was a need for a helicopter that could carry more security forces members, could get them to launch facilities or convoys faster, and which had greater range, and that's what we have been working on since the mid- to late-1990s.

Senator NELSON. From your testimony, it appears that the mission for the new helicopters will be missile field support, as you've just indicated, and to meet the continuity of government needs for the military district of Washington. Is it clear that the new common vertical lift support platform will support only those two missions and won't serve as a combat search and rescue function?

General KOWALSKI. I think the acquisition decision has yet to be made in terms of the final elements and the strategy to go forward. Right now, in the capability document that we had put together it is a lift support platform for the missile field security, for continuity of ops, continuity of government here in Washington, DC, and there is also some platforms that are used out in the Pacific.

Senator NELSON. How many helicopters do you expect might be needed to achieve each mission? Do you have a number in mind?

General KOWALSKI. Senator, I would probably have to give you for the record a precise number. That number is probably somewhere between 80 and 100.

[The information referred to follows:]

The Air Force needs 42 Common Vertical Lift Support Platform helicopters for missile field security and 27 to meet the continuity-of-government requirements for the Air Force Military District of Washington. There are 24 additional helicopters required for Pacific Air Forces, Air Force Materiel Command, Air Force Special Operations Command, and AETC training and transport needs.

Senator NELSON. I guess that's everything that I have. There's a personnel concern. We should try to address this and then I think we can go to the secure location. When you work in the nuclear fields, obviously that can be difficult for personnel. Do either of you have any challenges bringing young airmen and sailors into the nuclear enterprise, and are these sought-after assignments or do they just sort of happen? Are they actually sought after by young men and women coming into the Service?

General KOWALSKI. Mr. Chairman, we don't really have any issues with getting airmen to join the Air Force and then being assigned tasks out in the missile fields. Probably the larger challenge that we face is getting our younger airmen, once they've reached that decision point, if they have been stationed in one of our northern bases where the environment's a little bit tougher, the smaller communities around them, they tend to leave the Service.

So we have been very concerned about that. We've been watching it very closely in cooperation with headquarters Air Force in terms of how do we improve quality of life and things up there for them.

But at the end of the day our airmen really want two things from us: they want to know what it is that they have to do and they want to know that what they do is important. The Secretary and the Chief have established Air Force Global Strike Command. I have been to each base at least three times. I've talked to these airmen. The functional directors on my staff have been out talking to the airmen.

They get the clear message that what they do is important and they also have the clear message about what it is that we need them to do. So I think we're making real headway, and we see it right now in our younger officers when they get to the decision point. Because of the numbers of ICBM missileers that we take in, the crew members, we don't need them at about the 5-year point.

A lot of them are allowed to do other things in the Air Force. Right now we have more volunteers to stay in the ICBM community in the nuclear enterprise than we have spots for. So right now that's a good sign on how the enterprise has turned around in the last few years.

Senator NELSON. Thank you for that update. Thank you all for your testimony today. We appreciate your being here and your service.

Senator SESSIONS. Just one question.

Senator NELSON. Sure.

Senator SESSIONS. General Kowalski, or maybe Chambers or whoever, the 1251 report stipulated a force structure of up to 420 ICBMs. That's a reduction of 30. When will the decision be made as to what that number will be? Have you decided that?

General KOWALSKI. Senator, I expect that decision to be made here shortly, within the next 3 months.

Senator SESSIONS. Will that allow you appropriate time to analyze all the factors necessary?

General KOWALSKI. Senator, yes. We have been looking at this for about 7 to 9 months already in terms of analyzing the costs and working down this path. Then as the Secretary of Defense has stated, the entry into force will be toward the end of the treaty. What we see right now as we look at the different options that we have is that, frankly, the critical path to make sure we're in compliance with the treaty is eliminating a lot of the phantom silos out there. So there's a lot of work to be done out in eliminating the silos.

But in terms of the force structure decisions, that's not a particularly driving force right now.

Senator SESSIONS. Thank you.

Senator NELSON. Again, thank you all.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR E. BENJAMIN NELSON

BOMBERS—UPGRADES AND FUTURE CAPABILITIES

1. Senator NELSON. General Kowalski and General Scott, the last time the longevity of the current fleet was reviewed, all of the bombers would begin to start retirements around 2035 to 2037. What is the expected retirement date for the B–52, the B–1, and B–2, based on current projections?

General KOWALSKI and General SCOTT. The Air Force expects to begin retiring legacy bomber platforms once the Long-Range Penetrating Bomber (LRPB) achieves Initial Operational Capability (IOC). Until that time, the Air Force will continuously assess the overall capacity and capability of our combat forces, including bombers, to ensure that the overall force is appropriately sized to provide for the Nation's defense. Potential legacy bomber retirements as a result of LRPB IOC will likely be a mix of B–1s and/or B–52s (numbers and dates to be determined). Legacy bomber retirement decisions will be based on operational requirements, operating costs, economic service life, and treaty compliance mandates. The Air Force plans to maintain the B–2 fleet to beyond 2040.

2. Senator NELSON. General Kowalski and General Scott, what are the serious life-limiting factors for each aircraft?

General KOWALSKI and General SCOTT. The Structural Service Life for each bomber is based on when a key component within the aircraft structure reaches the point where further repair is not economically viable. Key components are tracked and service life is updated through the Aircraft Structural Integrity Program. The current limiting factor for the B–52 is the wing upper surface. For the B–1 it is the wing lower surface. For the B–2 it is the rudder attach points. All three bomber types are currently projected to reach their Structural Service life beyond 2040.

3. Senator NELSON. General Kowalski and General Scott, all of the current bomber aircraft have modernization programs of varying types underway. Has a comprehensive plan been developed for each bomber aircraft to sustain and modernize each bomber to assure that each platform remains capable through the projected future life for each bomber and to meet the retirement date outlined above?

General KOWALSKI and General SCOTT. Air Force Global Strike Command (AFGSC) possesses the B–2 and B–52 dual-capable bombers. These aircraft each have plans detailing current and future sustainment and modernization requirements. The most recent B–2 Long Range Capability Flight Plan is dated November 2009 and addresses sustainment and modernization requirements to ensure the platform remains capable through 2058. The most recent B–52 Road Map is dated December 2007 and outlines sustainment and modernization requirements to ensure the platform remains capable through 2040. AFGSC is currently writing Bomber Master Plans for both of these platforms. The Master Plans will build on these previous plans and provide updated sustainment and modification requirements designed to keep the platforms capable through their life expectancies. AFGSC will publish these plans later this year and look to publish future plans until the new bomber attains IOC.

Air Combat Command (ACC) possesses the B–1 conventional bomber. The B–1 Roadmap dated October 2007 addresses sustainment and modernization requirements to ensure it remains capable through 2025. The Bomber Force Structure Study from February 2008 estimates the structural life of the platform out to 2040. ACC and the B–1 Systems Program Office (SPO) at Tinker Air Force Base are currently producing a Strategic Action and Investment Plan (SAIP) that will update and validate the sustainment and modernization efforts for the B–1 to ensure that it remains viable through its expected service life of 2040. The SAIP will be published later this year.

4. Senator NELSON. General Scott, several of the upgrade programs are needed to prevent the bombers from being grounded. The B–1, for example, had three programs that had to be in place this year to prevent grounding. These three programs are the Central Integrated Test System (CITS), the Vertical Situation Display, and the Radar Modernization and Improvement Program (RMIP). Are all these programs on track to be completed by the end of the year to prevent grounding?

General SCOTT. All three modification programs are on track to begin installations early enough in 2012 to prevent grounding. The RMIP production contract was awarded on 30 September 2010. First kit deliveries begin in the spring of 2012 with the first aircraft modification scheduled for June 2012. The CITS program has completed development, and the production contract award is projected for June 2011. The Vertical Situation Display Upgrade (VSDU) program is scheduled to begin flight test this summer. Early procurement of critical kit parts has been authorized, and the contract award is projected for June 2011. Kit deliveries for both CITS and VSDU are scheduled to begin in September 2012 with first aircraft installation starting in November 12.

5. Senator NELSON. General Kowalski and General Scott, the Global Strike Command is now fully operational. Are there any plans to move the B–1 to Global Strike? If not, why not?

General KOWALSKI and General SCOTT. Currently there is no plan to move the B–1 from ACC to AFGSC. The decision to transfer only the nuclear capable bombers to AFGSC was focused and deliberate, given their primary mission of safe, secure, and effective nuclear deterrence. Maintaining the B–1 within the ACC portfolio supports ACC's tasked role as the lead integrator for the Combat Air Force.

B–1 RETIREMENTS

6. Senator NELSON. General Scott, in the fiscal year 2012 budget request the Air Force has proposed to retire six B–1 bombers. What are the cost savings associated with these retirements?

General SCOTT. The retirement of six B–1s will provide a total fiscal year 2012 savings of $62M in procurement and sustainment funding.

7. Senator NELSON. General Scott, how much of the savings will go to each of the B–1, other bombers, and Air Force higher priorities?

General SCOTT. The Air Force is reinvesting $33 million in fiscal year 2012 into critical B–1 sustainment and modernization programs to ensure the health of the remaining fleet. These programs include procurement and installation of VSDU and

CITS sustainment efforts, Fully Integrated Data Link capability upgrade, and procurement of critical initial spares for these modifications. The Department applied the remainder of the savings from the B–1 reduction to other Air Force and Department of Defense (DOD) priorities to include continuing to strengthen the nuclear enterprise and investing in Building Partnerships.

8. Senator NELSON. General Scott, will the retirement have any impact on the Air Force ability to meet any operational plan or other requirements?

General SCOTT. The retirement of six B–1 bombers will free up funding to modify the remaining B–1 aircraft. The modifications to the remaining aircraft will improve their ability to respond to Combatant Commander operational taskings and ensure their viability in the future.

Tactical and campaign level analysis conducted by Air Force Studies and Analysis has indicated a reduction of six B–1 primary aircraft authorizations (three combat coded and three training coded) can be taken with limited risk against currently approved Office of the Secretary of Defense (OSD) Analytic Agenda scenarios. Cost per flying hour and mission capable rate analyses further supported a modest B–1 reduction as a wise reinvestment strategy geared toward increasing the pool of equipment spares and freeing funds to source critical sustainment and capability modifications. The Air Force expects to achieve an increase in aircraft availability in the near-term as a result of these retirements and monies reinvested, in part, to fund fleet modernization programs. Funded programs include fully integrated data link, vertical situation display, and CITS upgrades, providing a capabilities-based bridge to the future Long Range Strike platform.

START REDUCTIONS

9. Senator NELSON. General Kowalski, Admiral Benedict, and General Chambers, the New Strategic Arms Reduction Treaty (START) allows 800 nondeployed missile launchers and nuclear capable bombers. Has there been a decision as to how the 800 nondeployed systems will be allocated?

General KOWALSKI and General CHAMBERS. The fiscal year 2012 Annual Update to the Report Specified in Section 1251 of the National Defense Authorization Act (NDAA) for Fiscal Year 2010 (Section 1251 Report) allocates the 800 total deployed and nondeployed launchers as follows: submarine-launched ballistic missiles (SLBM)—280; intercontinental ballistic missiles (ICBM)—up to 454; and nuclear capable bombers—up to 66. Within the bomber force we will maintain all 20 B–2s as dual capable bombers. Up to 700 of these systems may be deployed (as defined by the treaty). We are assessing how the nondeployed systems might be allocated during the treaty period.

Admiral BENEDICT. One of the New START treaty central limits is a limit of 800 deployed plus nondeployed ICBM and SLBM launchers and deployed plus nondeployed heavy bombers, to be achieved by 7 years after entry into force of the treaty. In order to meet this limit, current U.S. plans call for a total of 280 deployed plus nondeployed SLBM launchers. Of this total, 240 will be deployed launchers (20 launchers on each of 12 strategically-loaded SSBNs) and 40 will be nondeployed launchers (20 launchers on each of 2 SSBNs in extended overhaul).

10. Senator NELSON. General Kowalski, Admiral Benedict, and General Chambers, has there been a decision on what constitutes a nondeployed missile launcher?

General KOWALSKI and General CHAMBERS. Under the New START treaty, a silo launcher at an operational ICBM base that does not contain an ICBM is considered a nondeployed launcher. In addition, those silo launchers at ICBM test ranges and space launch facilities are accountable as nondeployed launchers. Plus, all ICBM silo training launchers are accountable as nondeployed launchers, of which the Air force currently has no launchers that fit this definition. Finally, non silo-based fixed launchers of ICBMs and space launch vehicles (i.e., "soft-site" launchers) at any of these facilities are not accountable as nondeployed or deployed launchers.

Admiral BENEDICT. As defined in the treaty:

> The term "nondeployed launcher of SLBMs" means an SLBM launcher, other than a soft-site launcher, that is intended for testing or training, or an SLBM launcher that does not contain a deployed SLBM.

In simpler terms, a nondeployed SLBM launcher is an accountable missile tube that is empty; thus, if the Navy were to remove an SLBM from its launcher, the status of that launcher (and the status of the SLBM) would change from deployed to nondeployed. A nondeployed SLBM launcher is accountable under the New

START treaty towards the central limit of 800 deployed plus nondeployed ICBM launchers, SLBM launchers, and heavy bombers.

SOLID ROCKET MOTOR INDUSTRIAL BASE

11. Senator NELSON. General Chambers, the cost of solid rocket motors (SRM) continues to grow. The National Aeronautics and Space Administration's decisions to halt the Constellation/Aries programs have, as we discussed last year, increased the portion of overhead costs borne by DOD. Now that the Air Force has completed Minuteman III upgrades and it will be several years before a new engineering effort is needed to sustain the Minuteman III through 2030, the Air Force is apparently not planning to invest in the SRM infrastructure. What are your thoughts on how to ensure the industry has the ability to support an additional life extension for Minuteman III and a replacement ICBM in the future?

General CHAMBERS. The Air Force is committed to support the industrial base for current and future strategic SRMs needs. The Air Force is developing a Minuteman III SRM Modernization concept which proposes a modernization program to leverage latest SRM technology development into replacement SRMs for MM III (expected need date post-2020). The proposal would operationally qualify modernized motor designs; replace current MM III motors with new SRM technology; utilize modern industrial practices; and posture DOD for future SRM requirements with transferable technologies. Many of these technologies are currently being matured in the ICBM Demonstration and Validation Program specifically designed to support industrial base by exercising the critical SRM systems engineering and design skills. We believe that this Modernization program will be able to provide the needed SRM development to sustain the Industry until the time comes for a replacement for the current MM III ICBM.

LONG-RANGE NUCLEAR CRUISE MISSILE

12. Senator NELSON. General Kowalski, in your prepared testimony you talk about the process for fielding a new long range nuclear cruise missile, starting with an analysis of alternatives (AoA) that will be completed in 2010. What is the assumption on the life of the existing nuclear cruise missile?

General KOWALSKI. The Air Force has two service life extension programs (LEP): one to sustain the air launched cruise missile (ALCM) through 2020, which is fully funded; and another to sustain the ALCM through 2030, currently being programmed for in the fiscal year 2013 Program Objective Memorandum (POM).

13. Senator NELSON. General Kowalski, when does the replacement need to be in place?

General KOWALSKI. Long-Range Standoff (LRSO) must be in place by 2030, which aligns with the projected end date for the ALCM service LEP.

14. Senator NELSON. General Kowalski, has there been any discussion about the warhead that will be used in the new cruise missile?

General KOWALSKI. Recommendations on the specific warhead for use in the new cruise missile are being developed by a cross-organizational Warhead Working Group with participation from Department of Energy (DOE)/National Nuclear Security Administration (NNSA), U.S. Strategic Command (STRATCOM), AFGSC, Air Force Nuclear Weapons Center (AFNWC), and Air Armament Center. There are several warhead candidates being considered, including the W80. Data from the LRSO AoAs will be used to help finalize the warhead recommendation. Final recommendations for warhead selection will be completed prior to Milestone A, which is currently scheduled for the fourth quarter of fiscal year 2013.

GLOBAL STRIKE COMMAND—HELICOPTERS

15. Senator NELSON. General Kowalski, much of the support equipment for the missiles is very old. What are your plans to address the issue of aging equipment, including the need to replace the Vietnam-era helicopters that support the missile fields?

General KOWALSKI. Support equipment is a critical component of the ICBM Master Plan, our overarching planning document for sustaining the Minuteman III through 2030. All ICBM support equipment needs are prioritized within the Master Plan to support our planning and programming process for building the POM submission. Two specific examples of support equipment needs highlighted in the Mas-

ter Plan and included in the Future Years Defense Program (FYDP) are replacements for the ICBM Payload Transporters and Transporter Erectors. The 17-year-old Payload Transporter fleet is currently funded in fiscal year 2011 for replacement with first deliveries projected to begin in fiscal year 2015. A program to replace the 21-year old Transporter Erector fleet is being considered as part of the fiscal year 2013 POM.

We intend to replace the UH–1N with the Common Vertical Lift Support Platform (CVLSP) with an initial operating capability in fiscal year 2015.

16. Senator NELSON. General Kowalski, why are new helicopters needed?

General KOWALSKI. The UH–1N does not have the four critical/fundamental key performance parameters (KPP) of speed, range, endurance, or payload capacity for the nuclear security mission or meet the continuity of government requirements for the Military District of Washington.

17. Senator NELSON. General Kowalski, when are new helicopters needed?

General KOWALSKI. Our continued reliance on the UH–1N platform for the missile field security results directly in 11 nuclear security deviations now. Those deviations will not be resolved until the CVLSP is fully fielded in our Missile Wings. Given this compelling need, AFGSC is pressing for an initial operating capability of fiscal year 2015 and an full operational capability (FOC) by fiscal year 2019, with FOC for the remainder of the Air Force fleet by fiscal year 2022.

18. Senator NELSON. General Kowalski, can the Air Force replace these helicopters with minimal or no development costs?

General KOWALSKI. Yes. The CVLSP program intends to procure a non-development, off-the-shelf, in-production helicopter that will require minimal or no development effort. The CVLSP program currently has $21.7 million budgeted for RDT&E from fiscal year 2012 through fiscal year 2014.

19. Senator NELSON. General Kowalski, from your testimony it appears that the mission for the new helicopters will be missile field support and to meet the continuity of government requirements for the Military District of Washington. Is it clear that the new CVLSP will support only those two missions and will not serve a combat search and rescue function?

General KOWALSKI. The CVLSP program will replace the UH–1N fleet that is supporting AFGSC nuclear security support, AFDW continuity of government missions, and a variety of other secondary missions, not including Combat Search and Rescue (CSAR). CSAR missions are currently performed with HH–60 helicopters. There is a separate acquisition program to address recapitalization of the HH–60 CSAR fleet.

20. Senator NELSON. General Kowalski, how many helicopters will be needed for each mission?

General KOWALSKI. The Air Force needs 42 CVLSP helicopters for missile field security and 27 to meet the continuity of government requirements for the Military District of Washington. There are 24 additional helicopters required for PACAF, AFMC, AFSOC and AETC training and transport needs.

21. Senator NELSON. General Kowalski, what is the total number that will be purchased?

General KOWALSKI. The CVLSP program plans to procure 93 helicopters for the various CVLSP missions. This will include 42 helicopters for AFGSC nuclear security support, 27 helicopters for the Air Force District of Washington continuity of government mission, and 24 helicopters for training and other CVLSP missions at four other MAJCOMs.

22. Senator NELSON. General Kowalski, when will there be a decision on the acquisition strategy for the helicopters?

General KOWALSKI. On 12 April 2011, the Secretary of the Air Force (SECAF) and Chief of Staff of the Air Force (CSAF) approved a full and open acquisition strategy for the CVLSP program. The funding in the fiscal year 2011 Appropriation and fiscal year 2012 President's budget will support the planned acquisition strategy that seeks to provide an IOC in fiscal year 2015.

QUESTIONS SUBMITTED BY SENATOR JEFF SESSIONS

FURTHER REDUCTIONS

23. Senator SESSIONS. General Kowalski, General Shackelford, Admiral Benedict, General Scott, General Chambers, and General Harencak, the President's National Security Advisor recently made comments at the Carnegie Endowment that the administration is currently "making preparations for the next round of nuclear reductions" and that DOD will "review our strategic requirements and develop options for further reductions in our current nuclear stockpile." He continued by stating that in meeting these objectives, the White House will direct DOD to consider "potential changes in targeting requirements and alert postures." What guidance and assumptions have you been given or told to follow in the design, development, and posture for modernizing the nuclear triad?

General KOWALSKI, General SHACKELFORD, General SCOTT, General CHAMBERS, and General HARENCAK. We have not received further guidance or assumptions from DOD. As stated in the fiscal year 2012 Annual Update to the Report Specified in Section 1251 of the National Defense Authorization Act, "DOD will invest in its nuclear delivery systems to ensure that existing capabilities are adequately sustained with essential upgrades and modifications. Additionally, DOD will seek to modernize systems to ensure continuing capability in the face of evolving challenges and technological developments."

Admiral BENEDICT. Strategic Systems Programs has been tasked to extend the life of the Trident II (D5) Strategic Weapon System to match the hull life of the *Ohio*-class submarine and to serve as the initial payload of the *Ohio* Replacement. SSP is extending the life of the W76 reentry system through a refurbishment program known as the W76–1. This program is being executed in partnership with DOE, NNSA. In addition to the W76–1, the Navy is in the initial stages of refurbishing the W88 reentry system. The Navy is collaborating with the Air Force to reduce costs through shared technology.

24. Senator SESSIONS. General Kowalski, General Shackelford, Admiral Benedict, General Scott, General Chambers, and General Harencak, in your best military judgment, how prudent is it to begin consideration of reductions past the New START levels?

General KOWALSKI, General SHACKELFORD, General SCOTT, General CHAMBERS, and General HARENCAK. It is prudent to begin consideration of reductions past the New START levels only to the degree that such consideration is based on national strategy. That strategy continues to affirm the central role of Deterrence. Deterrence applied to the complexities of the 21st century strategic and operational reality requires deliberate analysis and planning. Such analysis of 21st century requirements for strengthening strategic Deterrence must also deliberately include Extended Deterrence and Assurance as a requisite, as our reliance on Allies and partners is fundamental.

National strategy also continues to affirm the efficacy of the Triad. Any strategy-based look at further reductions needs to carefully assess the effects on the complementary capabilities inherent in the three legs of the Triad. Such an assessment will show that consideration of further reductions is not accomplished by application of mathematical formulae alone, but via thorough analysis of the attributes of each leg at lower levels; indeed, fewer warheads and fewer platforms can fundamentally alter overall deterrent attributes.

So, then, the prudence of beginning consideration of reductions past New START levels is based on the comprehensive analysis a strategy-to-task methodology requires. Such analysis may soon be underway, and the Air Force is prepared to fully engage with OSD and the combatant commands in providing analytical support and military advice.

Admiral BENEDICT. Issues involving reductions of nuclear systems past the levels specified in the New START treaty is a consideration for the executive branch, in consultation with the Office of the Secretary of Defense, the Joint Staff and the responsible combatant commander, STRATCOM.

BALANCE BETWEEN AFFORDABILITY AND CAPABILITY

25. Senator SESSIONS. General Kowalski, General Shackelford, Admiral Benedict, General Scott, General Chambers, and General Harencak, as I mentioned earlier, the modernization and sustainability of strategic deterrent is an immense yet critical investment that will cost around $20 billion per year for the foreseeable future. Within each of your portfolios what steps are being taken to address affordability?

General KOWALSKI, General SHACKELFORD, General SCOTT, and General CHAMBERS. Our ability to sustain the current systems we have is viable. DOD will invest in its nuclear delivery systems to ensure that existing capabilities are adequately sustained with essential upgrades and modifications. Additionally, DOD will seek to modernize systems to ensure continuing deterrent capability in the face of evolving challenges and technological developments.

The Minuteman III will be sustained through 2030. Weapon system requirements are continuously reviewed and if sustainment programs not previously programmed become necessary they will be implemented to ensure we meet the requirement " . . . to maintain a sufficient supply of launch test assets and spares to sustain the deployed force of such missiles through 2030." (ref: H.R. 5122 Section 139)

The Air Force plans to maintain heavy bombers for the indefinite future to provide long-range conventional and nuclear attack.

DOD will sustain the current ALCM until a classified follow-on capability is fielded.

Dual-Capable aircraft will continue to carry the B61 gravity bomb. The B61 will be sustained through LEPs and the Air Force will provide a new tail kit during the LEP. Additionally, the F–35 will be equipped to carry the B61.

Admiral BENEDICT. A low-rate production continuity procurement strategy was extensively reviewed and approved by DOD and Congress. We have been in execution for nearly 15 years. This procurement strategy has proven successful, based on the demonstrated superb performance of the Trident II (D5) weapon system. The Navy submitted a report to Congress in December 2002 that detailed the impact of alternative full-funded procurement strategies and recommended continuation of the current production continuity procurement strategy. Continued production of critical components represents the best balance of cost and risk to extend the life of the D5 missile.

In addition, examples of other affordability initiatives SSP has implemented are:

(1) Integrated Support Facility consolidation for missile guidance increased efficiency and improved supportability by consolidating the missile guidance infrastructure to support the MK6 and deploy MK6LE.
(2) Shipboard Electronics Repair Facility established to repair and recertify shipboard Strategic Weapons Systems and Attack Weapon Systems electronic equipment. A common repair facility has yielded both cost avoidance and savings for SSP in the out-years by eliminating duplicate repair capabilities across four locations.
(3) Moving Navigation efforts to Heath, Ohio, which provides co-location with the Air Force efforts and also is a lower cost-of-living area.

General HARENCAK. There can be no doubt that nuclear weapons are expensive. Everything about them and their delivery vehicles is meticulously designed, overengineered, and has multiple, redundant failsafes. Add to this the fact that many of the weapons and delivery vehicles are being sustained well beyond their design lives, and costs will inevitably be high. However, one of the Nuclear Weapons Center's 5 Priorities, as defined in its strategic plan, is entitled "Ensure Resource Stewardship," and that is something we take very seriously.

By using smart engineering and logistics processes, we're constantly improving our ability to determine what hardware can be refurbished and what must be replaced. As a result, we're planning integrated roadmaps and schedules to avoid bottlenecks in production that result in higher costs. As we continue to streamline our sustainment processes, we're beginning to get a better understanding for the effects of advancing or deferring certain sustainment actions, which will allow us to plan more efficiently with an eye to reducing costs and to ensure that the needs of the warfighter are met.

In partnership with the AF Program Executive Officer for Strategic Systems (AFPEO/SS), we're also looking at innovative teaming opportunities to produce needed technology. For example, in the past, if an Air Force warhead required a new fuzing assembly, the Air Force would foot the entire bill. Now, we're looking at combining efforts with Navy SSP in the Integrated ICBM Fuze Program. Since the requirements for these fuzes are similar—though not identical—we plan to develop a common family of components for the Air Force Mk12A and Mk21 reentry vehicles as well as the Navy's MK 5 reentry body. These building block components should be adaptable into fuzes for all three systems. The savings vice three separate programs should be very significant.

The bottom line is that the Center will do nothing that will compromise nuclear safety or security. However, as conscientious stewards of the Air Force nuclear arsenal, we are acutely aware of the fiscal environment and will continue to seek inno-

vative ways to serve the vital goals of meeting warfighter needs, preserving nuclear surety and ensuring fiscal responsibility.

26. Senator SESSIONS. General Kowalski, General Shackelford, Admiral Benedict, General Scott, General Chambers, and General Harencak, within each of your portfolios, what is the timeline these modernization efforts must be accomplished?

General KOWALSKI, General SHACKELFORD, General SCOTT, General CHAMBERS, and General HARENCAK. The timeline for the below key modernization efforts is an estimate and will change as required. Current projected delivery dates are:

1. B–52 1760 IWB: 2013
2. CVLSP: 2014
3. B61 LEP: 2017
4. Joint Fuze: 2019 (Mk21); 2020 (Mk12A)
5. B–2 DMS: 2018
6. LRSO: 2023

Acronyms:

CVLSP: Common Vertical Lift Support Platform
DMS: Defensive Management System
IWB: Internal Weapons Bay
LEP: Life Extension Program
LRSO: Long-Range Standoff

Admiral BENEDICT. Modernization efforts are occurring now for the Trident II (D5) weapon system. The Navy and OSD agreed to extend the life of the D5 missile to match the *Ohio* class submarine service life and to serve as the initial payload on the *Ohio* Replacement based on programmatic advantages and the ability to meet effectiveness requirements that are derived from the national deterrence strategy. The life extension is being accomplished through an update to all the Trident II (D5) Strategic Weapons System (SWS) subsystems: launcher, navigation, fire control, guidance, missile, and reentry. Our flight hardware—missile and guidance—life extension efforts are designed to meet the same form, fit and function of the original system, in order to keep the deployed system as one homogeneous population and to control costs. The Initial Operating Capability of the D5 Flight Hardware Life Extension efforts is scheduled in fiscal year 2017. The Shipboard Systems efforts are ongoing and will support the baseline configuration for the *Ohio* Replacement Program Strategic Weapon System.

27. Senator SESSIONS. General Kowalski, General Shackelford, Admiral Benedict, General Scott, General Chambers, and General Harencak, within each of your portfolios, what is our ability to sustain the systems we currently have?

General KOWALSKI, General SHACKELFORD, General SCOTT, and General CHAMBERS. In support of the Secretary of Defense's efficiency initiatives, program managers are required to treat affordability as a requirement. Specifically, at Milestone A, the Acquisition Decision Memorandum (ADM) will contain an affordability target to be treated by the program manager as a KPP. At Milestone B, program managers will present a systems engineering tradeoff analysis showing how cost and risk varies as major design parameters and time to complete are varied.

Furthermore, new "Will Cost/Should Cost" direction will incentivize both industry and the program office to aggressively scrutinize every element of program cost as they pursue affordability solutions to our nuclear deterrence capability requirements.

Admiral BENEDICT. The fiscal year 2012 President's budget is sufficient to sustain the safety and reliability of the Trident II (D5) SWS. However, D5 SWS has just completed 20 years of deployed service and is fast approaching its 25-year design life goal. To address aging concerns, the Strategic Systems Programs has been tasked to extend the life of the Trident II (D5) SWS to match the hull life of the *Ohio* class submarine and to serve as the initial payload of the *Ohio* Replacement. Life extension efforts are being accomplished through an update to all the Trident II (D5) SWS subsystems: launcher, navigation, fire control, guidance, missile and reentry. These efforts will provide the Navy with the SWS needed to meet operational requirements throughout the *Ohio* service life and will serve as the initial SWS on the planned follow-on platform.

General HARENCAK. Within the AFNWC portfolio, we have the LGM–30G Minuteman III ICBM, the AGM–86 ALCM, and support equipment for these systems. AFNWC also sustains the support equipment and handling gear for gravity bombs and weapons storage areas.

AFNWC's ability to sustain the Minuteman III ICBM is good. As an aging system now 50 years old (the original Minuteman infrastructure was emplaced starting in

1961, most of the flight equipment dates from the 1970s), there are issues with aging components and infrastructure, parts obsolescence, diminishing manufacturing, loss of industrial base, and other concerns. However, 50 years of experience has taught us how to be good stewards of this system, and we have conducted dozens of LEPs over that period. We have developed comprehensive roadmaps that show the way for us to sustain this weapon system through 2030 and minimize risks. Additionally, the Air Force participates in a robust Force Development Evaluation (FDE) program, which includes flight, ground and C2 testing to ensure that any weaknesses with a force-wide impact are detected as early as possible so that a fix can be planned and executed as quickly as possible. We also monitor facility hardness to ensure that ICBM infrastructure remains survivable in the event of attack. Support equipment is another area that requires constant monitoring. Equipment that has worked and been well maintained for decades eventually wears out and requires refurbishment or replacement. AFNWC is currently working on refurbishing and replacing a number of pieces of support equipment that are well past their designed lifespans. In many cases, it is becoming increasingly difficult to find manufacturers who can build systems and components that can still integrate effectively with the Minuteman system. As we continue to look at a successor to the Minuteman ICBM, we remain mindful that this system has served with unsurpassed reliability for a half-century and can continue for some time into the future, though the cost of sustaining such an old system will eventually start to increase more and more rapidly if modernization of infrastructure, ground equipment and flight equipment do not continue.

Sustainability prospects for the ALCM are also good. As this system is significantly newer than the Minuteman ICBM, it has fewer problems with disappearing suppliers, industrial infrastructure and obsolete technology. We continue to conduct a robust FDE program on ALCM as well, and have discovered some issues with aging and/or problematic components, which we are in the process of addressing. Additionally, we are refurbishing and upgrading some ALCM ground equipment, such as the Electronic System Test Set to improve reliability through funding of the long term modernization plan, as this test set is crucial to sustaining the ALCM through 2030. Though AFNWC is involved in the LRSO AoAs to determine the requirements for the successor to the ALCM, we fully realize that this system is amply capable of serving through 2030.

In addition to the Minuteman and ALCM, AFNWC sustains the loading and support equipment for gravity bombs, both in CONUS and overseas. We've recently been executing a Service LEP for the Weapons Maintenance Truck (WMT) used to sustain gravity bombs in Europe. Prior to AFNWC intervention, the WMT was in very poor repair and frequently necessitated sharing a single working vehicle between multiple air bases, hundreds of miles apart. At this time, each base has its own working WMT. Additionally, the Air Force Program Executive Officer for Strategic Systems (AFPEO/SS) is working to replace the WMT system entirely with a much newer and more capable system (the Secure Transportable Maintenance System).

The bottom line is that AFNWC and its allies in the nuclear sustainment business understand what it will take to keep the systems in our portfolio going and we will take the necessary steps to preserve their surety and effectiveness. This task becomes harder and more expensive as the systems continue to age, but there is no point in the future we can identify beyond which the systems become unsustainable

ICBM SUSTAINMENT AND MODERNIZATION

28. Senator SESSIONS. General Kowalski and General Chambers, a recent article in the Air Force Times cited a failure review board's conclusion that an equipment failure was responsible for the hour-long communication outage at F.E. Warren Air Force Base that affected 50 nuclear missiles last fall. Given the age of the current ICBM infrastructure, some have speculated that the incident may be indicative of the aging ICBM infrastructure. Do you believe the incident is indicative of the aging ICBM infrastructure?

General KOWALSKI and General CHAMBERS. No, the Minuteman III Weapon System continues to perform as a safe, secure, and effective deterrent. Our newest Major Command, AFGSC, conducted an extensive review of last fall's event and determined this was an isolated incident and is not indicative of age-related systemic problems within the ICBM force. The Minuteman III ICBM weapon system alert rate exceeds 99 percent.

In addition, consistent with the NDAA Section 1251 Report, the Air Force, through the leadership of AFGSC, has developed sustainment and modernization

plans, specified in the ICBM Master Plan, to ensure the infrastructure necessary to support and operate our ICBM fleet. We feel these plans will meet the challenges required to sustain the MMIII to 2030.

29. General Kowalski and General Chambers, do you believe it was an isolated incident?

General KOWALSKI and General CHAMBERS. Yes, the Minuteman III Weapon System continues to perform as a safe, secure, and effective deterrent. Our newest Major Command, AFGSC, conducted an extensive review of last fall's event and determined this was an isolated incident and is not indicative of age-related systemic problems within the ICBM force. The Minuteman III ICBM weapon system alert rate exceeds 99 percent.

Consistent with the NDAA Section 1251 Report, the Air Force, through the leadership of AFGSC, has developed sustainment and modernization plans, specified in the ICBM Master Plan, to ensure the infrastructure necessary to support and operate our ICBM fleet. We feel these plans

30. Senator SESSIONS. General Kowalski and General Chambers, how confident are you that the Air Force will be able to sustain the current ICBM force through 2030?

General KOWALSKI and General CHAMBERS. Very confident. The AF is committed to sustaining and modernizing the existing Minuteman III ICBM system through 2030. The fiscal year 2012 PB request includes approximately $1.9 billion of investment funding over the FYDP (fiscal year 2012–2016) to extend the existing MM III ICBM weapon system through 2030. All aspects of the ICBM Federal and contractor community are being exercised and funded to sustain and/or modernize (through refurbishment or replacement due to obsolescence and/or diminishing vendor base) the MM III ICBM force and associated infrastructure.

31. General Kowalski and General Chambers, when should a decision be made for pursuing the development of a follow-on ICBM?

General KOWALSKI and General CHAMBERS. The 2010 Nuclear Posture Review stated that studies are needed now to inform a decision on a follow-on ICBM. To meet this need, pre-AoA efforts have already begun. AFGSC has already initiated a Ground-Based Strategic Deterrent Capability Based Assessment (CBA). The CBA supports development of the Initial Capabilities Document (ICD) which establishes baseline requirements for any future Minuteman III replacement program. The next step is the actual AoA which will be accomplished in fiscal year 2013–2014.

Once the AoA is completed it will be used to recommend the best ICBM follow-on options from a broad range of alternatives. A final decision is needed sometime in the fiscal year 2015 timeframe.

AIR LAUNCHED CRUISE MISSILE

32. Senator SESSIONS. General Chambers, are there any challenges associated with sustaining the ALCM until 2030?

General CHAMBERS. Yes. ALCM faces the common, yet manageable challenges you might expect any weapon system to face that is having its service life extended. Any system that has been in the inventory for more than two decades must manage diminishing manufacturing source issues, weapon system reliability concerns and service life extension priorities. The Air Force has a robust FDE (flight test), functional ground test, analytical condition inspection and aging and surveillance program to assist with managing these challenges.

33. Senator SESSIONS. General Chambers, the fiscal year 2012 budget includes $884 million over the next 5 years for the development of a new ALCM. Has the Air Force decided if this new ALCM will be nuclear capable at the outset?

General CHAMBERS. Yes, the Air Force has decided that the new ALCM will be nuclear capable at the outset.

34. Senator SESSIONS. General Chambers, if nuclear, does the Air Force intend to use the W–80, and if so, when would the LEP on the W–80 have to begin so that it will be available for the new cruise missile?

General CHAMBERS. The Air Force has decided that the new ALCM will be nuclear capable at the outset. Recommendations on the specific warhead for use in the new cruise missile, and requisite LEP start date are being developed by a cross-organizational Warhead Working Group with participation from NNSA, STRATCOM,

AFGSC, AFNWC, and AAC. There are several warhead candidates being considered, including the W80. The Warhead Working Group is also supporting the development of an integrated master schedule that will include a required LEP start date. Data from the LRSO AoAs will be used to help finalize the warhead recommendation. Final recommendations for warhead selection and LEP start date will be completed prior to Milestone A, which is currently scheduled for the fourth quarter of fiscal year 2013.

B–61

35. Senator SESSIONS. General Chambers, what is the current status of the Air Force's efforts on the B–61's tail subassembly development and overall integration efforts?

General CHAMBERS. The Air Force is currently preparing for a combined Material Development Decision (MDD)/Milestone A Defense Acquisition Board, scheduled for the fourth quarter of fiscal year 2011. Preparations include developing and finalizing technology development and acquisition strategies, contracting strategies, requirements, and cost estimates. The Air Force is also drafting statutory and regulatory documents required for MDD and Milestone A. In addition, the Air Force is gathering data from three ongoing concept development contracts and has established integration working groups that include participation from platform program offices and the DOE/NNSA.

36. Senator SESSIONS. General Chambers, do any challenges currently exist in meeting the fiscal year 2017 deadline for the first production unit (FPU)?

General CHAMBERS. Yes, challenges do exist, but both the DOD (Air Force) and DOE (NNSA) efforts are on track to meet an fiscal year 2017 FPU. At this stage of the acquisition program, the primary challenge we have identified is synchronizing the DOE and DOD acquisition efforts, and emphasis has been placed on communication at all levels. One specific forum we have established to ensure communication between the Air Force and NNSA is a flag officer level Senior Management Team (SMT). The SMT meets monthly to review progress and provide guidance to the Air Force and NNSA program management teams.

AIR FORCE REPLACEMENT HELICOPTERS

37. Senator SESSIONS. General Kowalski and General Chambers, what is the current acquisition strategy for the Air Force procurement of the CVLSP, the helicopter replacement program for the current fleet of UH–1s?

General KOWALSKI and General CHAMBERS. The SECAF and CSAF approved a full and open competition acquisition strategy for the CVLSP program on 12 Apr 2011. Schedule milestones include request for proposals in late fiscal year 2011, contract award in later part of fiscal year 2012, leading to an IOC in fiscal year 2015. The funding in the fiscal year 2011 Appropriation and fiscal year 2012 President's budget request is considered adequate to support this acquisition strategy.

38. Senator SESSIONS. General Kowalski and General Chambers, will this be a new development program or do any current DOD airframes exist that could meet requirements at a lower cost?

General KOWALSKI and General CHAMBERS. The CVLSP program intends to procure a non-development, off-the-shelf, in-production helicopter that will require minimal or no development effort. There are helicopters currently in production including DOD airframes that could potentially satisfy CVLSP requirements.

START TREATY IMPLEMENTATION

39. Senator SESSIONS. General Kowalski and General Chambers, what is the anticipated cost for Air Force implementation of the New START treaty?

General KOWALSKI and General CHAMBERS. The Air Force continues to evaluate projected cost for implementation of the New START treaty. However, until a final decision is made on deployed Air Force strategic delivery vehicles, as well as elimination methods for the ICBM silos and conversion method for the B–52, an accurate cost is not feasible at this time.

40. Senator SESSIONS. General Kowalski and General Chambers, what is the Air Force plan for meeting New START levels for deployed ICBM launchers?

General KOWALSKI and General CHAMBERS. Our ICBM planning efforts are focused on complying with the limit as dictated in the NDAA Section 1251 Report of up to 420 deployed ICBM launchers. While a final force structure decision has not been made, the Air Force continues to analyze several options to meet the New START limits.

41. Senator SESSIONS. General Kowalski and General Chambers, the 1251 report that accompanied the New START treaty stipulated an ICBM force structure of up to 420 (a reduction of 30). When will a decision on the actual number be made?

General KOWALSKI and General CHAMBERS. The Air Force is currently working with the Joint Staff to evaluate force structure options and to make a final decision on the number of deployed ICBMs and nuclear-capable bombers. When the actual decision will be made is still to be determined.

42. Senator SESSIONS. General Kowalski and General Chambers, does the Air Force intend to spread reductions across multiple ICBM wings or would it be more economical to eliminate a block of silos at an individual base? If so, why? If not, why?

General KOWALSKI and General CHAMBERS. The Air Force has not made a final decision on how reductions in deployed ICBMs would be made across the force. Some of the considerations involved in this decision are the method of reduction (elimination vs. nondeployed status), ongoing modification programs, technical characteristics of the Minuteman III weapon system, the conditions of specific launchers and the actual number of reductions that have to be made. The Air Force continues to evaluate options.

[Whereupon, at 3:34 p.m., the subcommittee adjourned.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 2012 AND THE FUTURE YEARS DEFENSE PROGRAM

WEDNESDAY, APRIL 13, 2011

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC FORCES,
COMMITTEE ON ARMED SERVICES
Washington, DC.

BALLISTIC MISSILE DEFENSE PROGRAMS

The subcommittee met, pursuant to notice, at 2:32 p.m. in room SR–232A, Russell Senate Office Building, Senator E. Benjamin Nelson (chairman of the subcommittee) presiding.

Committee members present: Senators Nelson, Levin, Udall, Shaheen, and Sessions.

Committee staff member present: Mary J. Kyle, legislative clerk.

Majority staff members present: Madelyn R. Creedon, counsel; Richard W. Fieldhouse, professional staff member; and Jessica L. Kingston, research assistant.

Minority staff member present: Daniel A. Lerner, Professional Staff Member.

Staff assistants present: Hannah I. Lloyd and Breon N. Wells.

Committee members' assistants present: Ann Premer, assistant to Senator Nelson; Casey Howard, assistant to Senator Udall; Lindsay Kavanaugh, assistant to Senator Begich; and Lenwood Landrum, assistant to Senator Sessions.

OPENING STATEMENT OF SENATOR E. BENJAMIN NELSON, CHAIRMAN

Senator NELSON. The subcommittee today meets to consider the ballistic missile defense (BMD) policies and programs of the Department of Defense (DOD) supported in the fiscal year 2012 budget request. We're pleased to have four distinguished public servants as witnesses today and we all appreciate your service to our country.

Dr. Brad Roberts is the Deputy Assistant Secretary of Defense for Nuclear and Missile Defense Policy. He's been deeply involved in developing missile defense policy and strategy, including last year's comprehensive Ballistic Missile Defense Review (BMDR). He continues to develop our strategy and is also working to ensure the implementation of those policies and strategies.

Lieutenant General Patrick O'Reilly is the Director of the Missile Defense Agency (MDA), which is responsible for conceiving, developing, testing, building, and delivering an integrated and operationally effective ballistic missile defense system (BMDS), including its component elements, to the Services and combatant commanders.

Rear Admiral Arch Macy is the Director of the Joint Integrated Air and Missile Defense Organization (JIAMDO) at the Joint Staff. He has been leading the joint warfighter assessment of our missile defense needs and has just completed an important study called "The Joint Capabilities Mix III (JCM–III)," which will help guide our future missile defense program and budget decisions. I would note that Admiral Macy is planning to retire at the end of this month, so this is likely his last hearing with the committee, but at his suggestion, not ours. We thank you for your many years of service to the Nation, Admiral Macy, and we wish you and your family the very best in your future.

Cristina Chaplain is the Director of Acquisition and Sourcing Management for the Government Accountability Office (GAO). She and her team have recently completed their annual assessment of MDA's progress on the development and acquisition of the BMDS, focusing particularly on issues of transparency and accountability.

As the BMDR emphasized last year, BMD is an essential national priority to protect the Homeland from the possibility of a missile attack from countries such as North Korea and Iran and to protect our forward-deployed forces, our allies, and partners overseas against the large and growing threat of regional missiles. As Admiral Winnefeld indicated last week, with our Ground-based Midcourse Defense (GMD) system we're ahead of the Homeland threat from North Korea and Iran, and we want to keep it that way. Our regional missile defenses, using the Phased Adaptive Approach (PAA), are designed to meet the existing threat and adapt to future threats.

Developing effective BMDS is an extremely complex technical endeavor. Consequently, it often takes longer than we would like. However, it's essential that we develop the systems carefully, test them adequately and realistically, and demonstrate that they work effectively before we produce and deploy them. Lives depend on it.

BMD is also expensive. This is particularly notable under the current constrained budget environment. The fiscal year budget request for missile defense is $10.7 billion and the planned budget for MDA for fiscal years 2011 through 2016 is roughly $52 billion. As GAO notes, the BMDS is the largest single acquisition program within DOD. So it's important that the administration has a policy that missile defenses must be fiscally sustainable and affordable and that we have appropriate accountability and transparency for the program.

Within this context, there are a number of issues we hope to discuss today. For example, concerning Homeland defense, we're interested to hear about proposed fixes, enhancements, and hedging options for the GMD system. We're interested to know what the implementation of the European Phased Adaptive Approach (EPAA) to missile defense is, to know more about that. This includes the development, testing, production, and deployment of the planned

elements for the EPAA, such as the Standard Missile 3 interceptor variants to be deployed with each successive phase. We'd also like to learn more about our efforts to expand other international cooperation, including efforts to cooperate with Russia on missile defense.

We thank all of you for your contributions to improving missile defense and to our security and we look forward to your testimony.

Now it's my pleasure to turn to my ranking member and good friend, Senator Sessions, for any opening comments he may have.

STATEMENT OF SENATOR JEFF SESSIONS

Senator SESSIONS. Thank you, Mr. Chairman. This is an important hearing and an important subcommittee. Thank you for your leadership. I've enjoyed working with you and respect you and your judgment on these issues very highly.

Today's hearing focuses on the President's 2012 budget for the MDA. I'm pleased that the top line of $8.6 billion includes a modest increase over last year, but I'm concerned that the overall 5-year budget represents a more than $2.2 billion reduction below last year's planned future defense budget. So I have concerns whether we have the ability to support the full cost and on-time delivery of the weapons systems we've invested so much in.

I've long urged that we focus more on the GMD system, the only system solely responsible for protecting the Homeland at this time. Unfortunately, the budget request continues to deprive GMD, I'm afraid, of the resources necessary to provide and refine the system.

General O'Reilly, you tout the improvements of GMD such as the emplacement of 30 interceptors and upgrades to the missile to Fort Greely area. Those accomplishments are welcome and appreciated, but without additional resources, the GMD program may not succeed, and the two recent test failures should serve as key reminders that more must be done to ensure the capability we have works and that it will improve over time. I'm confident that the difficulties we are having will and can be solved, but we have to spend some time and effort on that.

I look forward to understanding why you believe you can achieve and sustain success in a program that needs more attention with a budget that's $1.4 billion below what you said you needed in the Fiscal Year 2011 Future Years Defense Plan (FYDP). After all the money we've spent on developing this program, it's really not the time to take our eye off the ball. It really needs to be completed. I think it would just be a tragedy if we didn't follow through here after all the decades of work.

The GAO questions the plan for the sustainment and modernization of GMD. Last year, GAO reported that DOD "still lacks full knowledge of GMD's capability and limitations" and that, although there is a need to continue development until 2020, the "acquisition of major GMD assets is nearly complete," and that DOD has shifted its focus to "improving its knowledge of GMD's capabilities and improving integration."

Given the two recent failures, I look forward to discussing whether or not we need to look back a bit here and make sure we're not ahead of ourselves.

The Aegis weapon system remains one of our most promising capabilities and its legacy of incremental development, refinement, and proven design is a cornerstone of its success. Last week, MDA awarded its first contracts for the new Aegis evolution, the SM–3 Block IIB, and I look forward to hearing more about the development plan for the IIB.

Nonetheless, I remain concerned that the schedule is overly optimistic. Development of the SM–3 Block I was an 8-year effort for an incremental upgrade of the proven SM–2 Block IV. The SM–3 Block IIB concept appears to be a far more significant upgrade and, according to some initial descriptions, could represent a significant departure from Standard Missile variants.

Furthermore, I question the decision not to include the Aegis program office in the early stage development, ignoring in my opinion the design philosophy that has epitomized success.

The PAA to missile defense establishes a global framework for regional uncertainties. If executed correctly and on time, it will represent a good approach that is both relocatable and scalable. According to the BMD review, the fourth phase of the PAA and SM–3 Block IIB will improve the defense of the Homeland. As we are all aware, this layered protection could have come earlier with the prior plan that we had from the prior administration. However, I agree that defending both Europe and the U.S. from Iran with only 10 interceptors was not sufficient—it was not going to provide the inventory necessary to deter Iranian aggression.

So I look forward to learning more on the anticipated Homeland defense capabilities of SM–3 Block IIB, how they compare to the previously planned two-stage GBIs, while the two-stage GBI has been designated as a contingency if the recent development of IIB takes longer than anticipated.

The JCM–III study to provide warfighter input on necessary global force requirements for sensors, interceptors, and launchers has just been finalized. I look forward to hearing more about this study.

Let me close by offering a special thanks to Admiral Macy for being here today. I understand you plan to retire this month and we congratulate you on your service and thank you for your commitment to your country.

Thank you, Mr. Chairman.

Senator NELSON. Thank you, Senator Sessions.

Senator Udall, do you have any opening comments that you might like to make?

Senator UDALL. I'm eager to hear from the witnesses.

Senator NELSON. Senator Shaheen?

Senator SHAHEEN. No.

Senator NELSON. If it's okay with everybody, let's have a 7-minute round. Is that satisfactory? [No response.]

General O'Reilly, you know we're more than halfway through fiscal year 2011 and DOD is still—oh, excuse me, yes. I guess you get a chance to talk first. That doesn't happen often enough. But thank you, Richard. Thank you.

You may even answer the question before I ask it, now that I've tipped you off. Will you start first, General O'Reilly?

STATEMENT OF LTG PATRICK J. O'REILLY, USA, DIRECTOR, MISSILE DEFENSE AGENCY

General O'REILLY. Good afternoon, Chairman Nelson, Ranking Member Sessions, other distinguished members of the subcommittee: I appreciate the opportunity to testify before you today on the MDA's $8.6 billion fiscal year 2012 budget request to develop protection of our Nation, our Armed Forces, allies, and friends against the continually growing threat, the proliferation of increasingly capable ballistic missiles.

In fiscal year 2012 we propose to continue our enhancement and integration of sensor, fire control, battle management, and interceptors in the BMDS, to improve the reliability and performance of our Homeland defense, and to defeat large raid sizes of a growing variety of regional ballistic missiles. By the end of fiscal year 2012 we will complete the initial fielding of a GMD system for Homeland defense against first generation intercontinental ballistic missiles (ICBM) potentially being developed by current regional threats. We will also continue our initial fielding of regional defenses against today's short-, medium-, and intermediate-range ballistic missiles that are in direct support of our combatant commanders.

I should note that our fiscal year 2012 budget request was predicated on receiving the fiscal year 2011 requested budget. Therefore, we will adjust our program accordingly once the final fiscal year 2011 budget is approved.

We have had significant accomplishments over the past year, including the conduct of 8 out of 8 planned flight tests using 13 successful targets, the first flight of a two-stage Ground-Based Interceptor (GBI), the third successful missile intercept by the Japanese Aegis program, a successful low-altitude intercept by the Terminal High Altitude Area Defense System (THAAD). We destroyed two boosting ballistic missiles with our Airborne Laser Testbed; and we proved sufficiently accurate missile tracks from two Space Tracking and Surveillance System satellites to enable a missile defense intercept without using ground radars.

Additionally, we supported Israel's successful intercept of a threat missile earlier last month. We also delivered 25 SM–3 IA interceptors, began the THAAD interceptor production, emplaced the 30th GBI, and completed the upgrade of the early warning radar in Thule, Greenland.

Today, MDA's top priority is to confirm the root cause of the most recent GBI flight test failure, then verify the resolution of the problem and successfully repeat the previous flight test. While the failure review board has only produced preliminary results, it is clear more ground testing and an additional non-intercept flight test of an upgraded GBI exoatmospheric kill vehicle will be required before the next intercept.

For the GMD, in fiscal year 2012 we are requesting funding for procuring five new GBIs, completing the construction of the GMD Missile Field 2 at Fort Greely, AK, the construction of a missile communications system on the east coast of the United States, placing Missile Field 1 in a storage mode for possible upgrade and operations in the future, and upgrading the early warning radar in Clear, AK.

Today 30 operational GBIs protect the United States against a limited ICBM attack launched from current regional threats. We closely monitor intelligence assessments with the intelligence community and if this capability is determined to be insufficient we are developing options to increase the number of operational GBIs and accelerate the delivery of new sensor and interceptor capabilities.

DOD is committed to brief Congress soon on our strategy to hedge against uncertainties in threat estimates. Additionally, I've answered questions in other hearings that I've testified to that it is my personal judgment that, in light of the two GBI test failures, the need for an additional non-intercept test, and the need to repeat the failed test, we will need to reassess the total number of GBIs we are procuring and reflect that assessment in the President's budget request for fiscal year 2013.

Our execution of the EPAA is on track for meeting the timelines outlined by the President in September 2009. For phase 1, or our initial capability in Europe, our first Aegis ballistic missile ship deployment, the U.S.S. *Monterey*, is on station. The latest command and control system upgrades are being installed at the U.S. European Command, and the Army Navy/Transportable Radar Surveillance (AN/TPY–2) forward-based radar will be available in August for deployment in southern Europe by the end of this year.

Finally, in a few days we will conduct a major test in the Pacific to verify the readiness of the phase 1 architecture against an intermediate-range ballistic target.

For phase 2, or our enhanced capability against medium-range ballistic missiles by 2015, we will conduct the first flight test of the next generation Aegis missile interceptor, the SM–3 Block IB, this summer and certify the associated upgrade of the Aegis fire control system in 2012. The design of the adaptation of the Aegis system for land basing, called Aegis Ashore, began last summer and the test site will be installed in Hawaii in 2013 and flight tested in 2014. The installation of the Aegis Ashore in Romania will also occur in 2014 and be fully operational by 2015.

For phase 3, or an enhanced capability against intermediate-range ballistic missiles by 2018, the SM–3 Block IIA interceptor is completing its preliminary design this year in support of flight testing in 2015 and deployment in 2018. We are preparing the Airborne Infrared sensor for early missile tracking using the Air Force's next generation sensor in fiscal year 2012, and we will begin the design process of the Precision Tracking Space System.

For phase 4, or medium and intermediate-range and ICBM early intercept capability in Europe by 2020, we competitively awarded concept design contracts for the SM–3 IIB interceptor to three industry teams last week. The SM–3 IIB development timeline is consistent with the average development timeline of other missile interceptors of its class to ensure a low development risk approach.

While not necessary for the defense of the United States against limited attacks by early generation ICBMs, the SM–3 IIB will complement the GMD, Aegis, and THAAD systems to greatly increase the cost-effectiveness of our missile defenses.

Beyond PAA phase 4, we are pursuing advanced technologies for more effective missile defenses in the future, to develop high-energy, compact, lightweight laser technologies.

Finally, the MDA continues to engage in international missile defense projects, studies, and analyses with over 20 countries and the North Atlantic Treaty Organization (NATO).

In conclusion, our fiscal year 2012 budget request funds the development of BMD capabilities that are flexible, survivable, cost-effective, and tolerant of uncertainties of intelligence estimates of both nation state and extremist ballistic missile threats.

Thank you, Mr. Chairman, and I look forward to answering your subcommittee's questions.

[The prepared statement of General O'Reilly follows:]

PREPARED STATEMENT BY LTG PATRICK J. O'REILLY, USA

Good afternoon, Chairman Nelson, Ranking Member Sessions, other distinguished members of the subcommittee. I appreciate the opportunity to testify before you today on the Missile Defense Agency's (MDA) $8.6 billion fiscal year 2012 budget request to develop protection for our Nation, our Armed Forces, allies, and friends against a growing threat—the proliferation of increasingly capable ballistic missiles. We continue to enhance and integrate sensor, fire control, battle management, and interceptor systems into the Ballistic Missile Defense System (BMDS) to improve the reliability and performance of our homeland defense and defeat large raids of a growing variety of regional ballistic missiles over the next decade. By the end of fiscal year 2012, we will complete the initial fielding of the Ground-based Midcourse Defense (GMD) system for homeland defense against first generation Intercontinental Ballistic Missiles (ICBMs) potentially being developed by current regional threats. We will also continue our initial fielding of regional defenses against today's short-range (1,000 km or less), medium-range (1,000 to 3,000 km), and intermediate-range ballistic missiles (3,000 to 5,500 km), or short-range ballistic missiles (SRBMs), medium-range ballistic missiles (MRBM), and intermediate-range ballistic missiles (IRBMs), respectively.

FISCAL YEAR 2010 ACCOMPLISHMENT HIGHLIGHTS

During this past year, we have improved our homeland defense by emplacing the 30th Ground Based Interceptor (GBI), upgrading two additional GBIs, installing a training node at Fort Greely, AK (FGA), and completing a significant upgrade of the Early Warning Radar in Thule, Greenland. Additionally, we had a successful two-stage Ground-Based Interceptor (GBI) booster test and conducted a three-stage GBI intercept test where we did not achieve our primary objective, but we did demonstrate integrated sensors and command, control, battle management, and communication (C2BMC) during the longest range flight test to date. During the past year, we also improved our regional defenses by converting 2 Aegis BMD ships, delivering 25 SM–3 IA interceptors, and increasing the Aegis BMD fleet to 20 operationally configured BMD ships. Aegis BMD ships carrying SM–3 IA interceptors are currently deployed and on-station in forward operating areas, including the USS *Monterey* as part of the first phase of the European Phased Adaptive Approach (EPAA). We also commenced production of Terminal High Altitude Area Defense (THAAD) Batteries 3 and 4 and the associated interceptors. We accelerated the refurbishment of an AN/TPY–2 radar for phase 1 of the EPAA and installed a C2BMC system and prepared a second AN/TPY–2 for deployment to U.S. Central Command. Moreover, we successfully flew 14 target missions, including a successful intercept of a separating MRBM with our Japanese allies using an SM–3 IA interceptor (thus completing the first BMD Foreign Military Sales (FMS) case), and conducted a successful intercept of a unitary SRBM with THAAD. For future capabilities, we demonstrated the ability of the two Space Tracking and Surveillance System (STSS) satellites to provide stereo, high-fidelity tracking capabilities and transfer tracks into C^2BMC. Our Airborne Laser Test Bed (ALTB) successfully destroyed two boosting ballistic missiles. We achieved our goal of demonstrating NATO Active Layered Theater Ballistic Missile Defense interoperability with the U.S. C2BMC in Joint Project Optic Windmill. Finally, we completed U.S. and Israeli Government project agreements on the Arrow 3 Upper Tier Interceptor, the David's Sling Weapon System, and an Israeli Test Bed. Recently, we supported Israel's successful intercept mission of a separating threat missile off the coast of California.

ENHANCING HOMELAND DEFENSE

MDA's top priority is to confirm the root cause of the most recent GBI flight test failure, verify the resolution of the problem, and successfully repeat the previous flight test. While the Failure Review Board has only produced preliminary results, it is clear more ground testing and an additional non-intercept flight test of an upgraded GBI Exo-atmospheric Kill Vehicle (EKV) will be required before the next intercept.

We are requesting $1.16 billion in fiscal year 2012 in Research, Development, Test, and Evaluation (RDT&E) funding for the GMD program (including completing the construction of Missile Field 2 at FGA), which will complete the initial fielding of the defense of our homeland against limited ICBM attacks. In fiscal year 2012, we also will continue to upgrade existing GBIs and acquire new GBIs to meet our minimum requirement of 26 operational GBIs at FGA, 4 at Vandenberg Air Force Base (VAFB), CA, and 22 GBIs for testing, stockpile reliability testing, and spares. Key to an effective GBI sustainment program is examining the results of flight tests (including the loss of two GBIs during recent flight testing) and reliability testing. In parallel, we continue GBI component vendor requalifications for the future GBI avionics upgrade and obsolescence program. Given the two flight test failures and the need for a new non-intercept flight and a repeat of the last flight test, we need to assess the procurement quantity of additional GBIs as part of the fiscal year 2013 President's budget request. The new missile field (Missile Field 2) will replace the prototype Missile Field 1, which will be placed in a storage mode for possible upgrade for operational use in the future. We will complete the construction of a second fire control node at FGA to allow testing or exercises to be conducted while simultaneously controlling the operational system. In addition to completing the upgrade of our new hardened backup power plant at FGA in fiscal year 2011, we will also complete the upgrade of the communications system at FGA in fiscal year 2012. Additionally, we will begin the planning, design and environment work for a GBI In-Flight Interceptor Communication System (IFCS) Data Terminal (IDT) on the east coast of the United States by 2015. This East Coast IDT will enable communication with GBIs launched from FGA and VAFB on longer flights, thus improving the defense of the eastern United States against potential ICBM threats from the Middle East. We also are requesting $177.1 million in RDT&E funding for the Sea-Based X-band radar in fiscal year 2012 for software upgrades to improve its discrimination capability.

In addition to GMD upgrades, we are requesting $222.4 million in fiscal year 2012 for BMDS Sensors for homeland defense, including support of the Upgraded Early Warning Radars (UEWRs) and AN/TPY–2 radars. Integration of the Thule, Greenland radar in fiscal year 2012 will make it a fully operational UEWR in the BMDS. We continue to upgrade the Clear Early Warning Radar in Alaska for full missile defense capability by 2016. In addition, a forward-based AN/TPY–2 X-band radar will be deployed to southern Europe to provide early tracking for both enhanced homeland and regional defense. We will continue to upgrade system software to address new and evolving threats, including enhancing Exo-atmospheric Kill Vehicle discrimination algorithms by 2015, improving GBI avionics, and increasing GBI interoperability with the Command and Control, Battle Management and Communications (C2BMC) system.

After last year's successful initial flight of a two-stage GBI, we plan to conduct an intercept flight test with a two-stage GBI as a potential hedge to allow for a longer intercept window of time if ICBMs were launched against the United States from Northeast Asia or the Middle East. However, as a consequence of the need to repeat the failed three-stage GBI flight tests, we plan to delay the first intercept test of the two-stage GBI from fiscal year 2012 to fiscal year 2014. Finally, we will continue development of the Standard Missile 3 (SM–3) IIB to protect our homeland in the future by having the capability to intercept first generation ICBMs within the regions from which they were launched.

HEDGE FOR PROTECTION OF THE UNITED STATES

Today, 30 operational GBIs protect the United States against a medium ICBM raid size launched from current regional threats. If this capability is determined to be insufficient for protection of the U.S. Homeland based on intelligence estimations of future threats, we have options to increase the number of operational GBIs and accelerate the delivery of new sensor and interceptor capabilities. The Department is committed to brief Congress soon on the results of our ongoing BMD analysis and our recommended hedge strategy.

ENHANCING REGIONAL DEFENSE

We are also currently deploying our initial missile defense capability against SRBMs, MRBMs, and IRBMs. Over the next decade we are enhancing this initial capability by developing increasingly capable missile defenses that can be adapted to the unique circumstances of each combatant command region. In regions where ballistic missile threats are a concern, the United States will tailor Missile Defense Phased Adaptive Approaches (PAAs) (like the European PAA (EPAA)) to plan the establishment of command and control, sensor, fire control, and interceptor infrastructures to provide fundamental defenses and facilitate the effective surge of transportable missile defense assets to their regions when needed.

The EPAA focuses on addressing missile defense interoperability with NATO and our allies and partners as the threat from the Middle East is anticipated to increase over the next decade. In November 2010, NATO Heads of State and Government agreed to develop an Alliance territorial missile defense capability to "provide full coverage and protection for all NATO European populations, territory and forces against the increasing threats posed by the proliferation of ballistic missiles." The United States has committed to provide the EPAA as a national contribution to this capability, built on the Active Layered Theater Ballistic Missile Defense command and control system, and we are encouraging our allies to field and provide national capabilities as well.

Phase 1: Initial SRBM, MRBM, and IRBM Defense in Europe—to be completed by the end of 2011. In this phase, our goal is to achieve an initial missile defense capability in Europe using the Aegis BMD 3.6.1 weapon system with SM–3 IA interceptors, forward-based AN/TPY–2 and SPY–1 radars, and the C2BMC system at Ramstein Air Force Base, Germany, which will improve connections to NATO command and control structures. The USS *Monterey* is at sea today and, when paired with the AN/TPY–2 radar, will provide initial BMD protection of southern Europe from existing SRBM, MRBM, and IRBM threats. While no decision on the location of the radar has been made, we expect to meet our 2011 deployment timeline. Additionally, THAAD batteries will be available for deployment in this and subsequent phases. The Army activated a second THAAD battery in October 2009, which is scheduled to complete training by the end of calendar year 2011. We are requesting $290.5 million in RDT&E funding to enhance communications and enable THAAD's launch-on-sensor network capability, which will allow THAAD to intercept threat missiles tracked by many different missile defense sensors. We also request $833.2 million for the production of 68 THAAD interceptors, 6 launchers, and 1 Tactical Station Group to be delivered by fiscal year 2014, and $380.2 million for the production of 2 AN/TPY–2 radars.

Phase 2: Enhanced MRBM Defense in Europe by 2015. Our goal in this phase is to provide a robust capability against SRBMs and MRBMs by launching several different interceptors to engage each threat missile multiple times in its flight. This architecture includes the deployment of the Aegis BMD 4.0.1/5.0 weapon fire control systems with SM–3 IB interceptors at sea and at an Aegis Ashore site in Romania. When compared to the current SM–3 IA, the IB will have an improved two-color seeker for greater ability to discriminate threat Reentry Vehicles from other objects, and it will have improvements to enhance reliability and producibility of the SM–3 IB's divert and attitude control system. These improvements also provide greater capability against larger sized raids. We are requesting $565.4 million for the production of 46 SM–3 Block IB interceptors to be delivered by fiscal year 2014 and $960 million for Aegis BMD to fund continued development and testing of the SM–3 IB as well as upgrades to Aegis 5.0 fire control software to support the operation of the SM–3 IB and IIA interceptors and associated flight tests. In fiscal year 2012, we are requesting $306.6 million to begin acquiring Aegis Ashore Missile Defense Systems (land-based SM–3) batteries—one for testing at the Pacific Missile Range Facility, and one for deployment in Romania by fiscal year 2015. We request $364.1 million for the C2BMC program for continued development of software and engineering to incorporate enhanced C2BMC capability into the C2BMC battle management architecture and enable interoperability among the BMDS elements, incorporate boost phase tracking, and improve system-level correlation and tracking.

Phase 3: Enhanced IRBM Defenses in Europe by 2018. The SM–3 Block IIA interceptor, being co-developed with the Japanese Government, is on schedule to be deployed at the Aegis Ashore site in Romania and at an additional Aegis Ashore site in Poland, and at sea, in 2018 to provide enhanced protection for European NATO countries from all ballistic missile threats from the Middle East. The fiscal year 2012 request for SM–3 Block IIA co-development is $424.5 million. Additional BMDS improvements during this phase include expanded coordination of missile defense fire control systems and improvements to radar discrimination. Likewise, be-

ginning with their first launch in 2017, the Precision Tracking Space System (PTSS) satellites will detect and track hostile ballistic missiles over their entire flight and enable earlier engagements to improve homeland and regional defense. Furthermore, the deployment of the Airborne Infrared (ABIR) sensor will provide the capability to provide early track of large ballistic missile raids from forward locations, decreasing the time between the enemy's launch of the first ballistic missile and the first launch of a ballistic missile defense interceptor.

Phase 4: Early Intercept Defense in Europe by 2020. The SM–3 IIB will provide an early intercept (pre-apogee) capability against MRBMs and IRBMs and provide an additional layer for a more enhanced homeland defense against ICBMs launched from today's regional threats. In fiscal year 2012, we are requesting $123.5 million to fund three industry teams to begin concept development of the SM–3 IIB design while MDA develops advanced propulsion and lightweight material technologies relevant to the SM–3 IIB interceptor. Advanced discrimination technologies also will be deployed during EPAA Phase 4 including GMD's use of fused data from the entire network of BMDS sensors (including enhancements from PTSS and ABIR sensor capabilities) to improve homeland defense.

PROVING MISSILE DEFENSE WORKS THROUGH ENHANCED TESTING

In fiscal year 2012, we are requesting nearly $1 billion of RDT&E funding for Testing and Targets. In collaboration with the Director, Operational Test and Evaluation and the Operational Test Agencies (OTAs), MDA updated its Integrated Master Test Plan. The updated test plan (version 11.1), consisting of 53 flight tests and 74 ground tests from fiscal year 2011 through fiscal year 2016, promotes cost-effectiveness by conducting fewer, but more complex, flight tests to achieve more objectives and enhance the realism of each test.

It is the Agency's plan to conduct later this month an Aegis BMD flight test using an SM–3 IA interceptor using data from the AN/TPY–2 radar passed through the C2BMC system to intercept an IRBM target. Later this summer we will also demonstrate Aegis BMD 4.0.1 fire control and the first flight test of the SM–3 IB interceptor. Additionally, we will conduct two critical ground tests this year to demonstrate the EPAA Phase 1 capability for defending European allies and deployed forces from multiple and simultaneous SRBM and MRBM threats.

We will hold a series of system-level operational flight and ground tests to demonstrate the initial capability against SRBMs and MRBMs for theater/regional defense as well as planning in fiscal year 2012 the first entirely operational test of the defense of the homeland by 2015. Each operational test will be conducted as realistically as possible and involve multiple targets of different ranges. This is where the Agency will test how well these layered defenses work. These tests are being planned and will be executed in concert with the BMDS Operational Test Agencies and under the oversight of the Department of Defense Director for Operational Test & Evaluation.. The BMD system under test will be operated by the soldiers, sailors, and airmen assigned to their respective missile defense equipment and placed under realistic wartime conditions to truly document the capabilities and limitations of the system. Finally, in fiscal year 2011, THAAD will execute a near-simultaneous engagement of an MRBM and SRBM.

DEVELOPING NEW CAPABILITIES

In fiscal year 2012, we plan to develop BMDS capabilities and technologies that can adapt as threats change and are fiscally sustainable. Early intercept capabilities enabled by satellites, forward based sensors and the SM–3 IIB interceptor will provide additional opportunities to kill threat missiles, enlarge protection areas, and improve the overall performance of the BMDS.

After completing all of their original on-orbit testing in 2010, we continue to operate the two STSS demonstration satellites to conduct cooperative tests with other BMDS elements and demonstrate the capability of STSS satellites against targets of opportunity. These tests demonstrate the ability of space sensors to provide high precision, real-time, tracking of missiles and midcourse objects that enable the fire control solutions BMDS interceptors. We are requesting $96.4 million for the STSS system in fiscal year 2012. Lessons learned from the two STSS demonstration satellites inform PTSS development decisions. We are requesting $160.8 million for PTSS in fiscal year 2012. The PTSS, a new program start in cooperation with Johns Hopkins University Applied Physics Laboratory, Navy Research Laboratory, Air Force SPACECOM, and industry will use simple designs and mature technologies to provide persistent classification and tracking capability of enemy ballistic missiles for areas of the globe that have ballistic missile activity. PTSS project scope includes

the delivery of PTSS ground segments and the launch of the first two PTSS spacecraft in fiscal year 2017.

In fiscal year 2012, we are requesting $46.9 million for the ABIR program. The ABIR program will provide a capability to track large ballistic missile raids with an airborne forward-based sensor, decreasing the time between the enemy's launch of the first ballistic missile and the first launch of a ballistic missile interceptor. Initially, we will integrate a sensor from the Multi-spectral Targeting System family of infrared sensors onto an MQ–9 Reaper Remotely Piloted Vehicle to prove that we can enable Aegis fire control solutions with forward-based airborne assets. In fiscal year 2012, using platforms and operators supplied by the Air Force, and working closely with the Navy, we propose to demonstrate the ability to provide external cueing, sensor performance, and timely and accurate ballistic missile tracking. Our objective is to integrate the ABIR sensor into a pod that can be attached universally to the wing of a variety of aircraft. Additionally, in fiscal year 2012 we are enhancing our command and control capability to handle larger threat missile raid sizes and leverage airborne and space sensor missile tracking data networks. We will continue our development and testing of a multi-sensor application (ABIR and space sensors) tasking and signal processing capability that will provide data with sufficient quality to enable Aegis, THAAD, and GMD fire control solutions for launching interceptors.

In fiscal year 2012, we are requesting $96.3 million for Directed Energy Research ($92.6 million for ALTB). Following the successful shoot downs of liquid-fueled and solid-fueled boosting ballistic missile targets with an airborne laser in fiscal year 2010, the Assistant Secretary for Defense Research and Engineering designated the ALTB as a science and technology test bed for high power laser research and development. In fiscal year 2012, we are teaming with the Air Force's Research Laboratory to use the ALTB for testing advanced directed energy technologies and conducting beam propagation and lethality testing. A primary objective of our directed energy program is to continue our partnership with Lawrence Livermore National Laboratory to develop Diode Pumped Alkaline-gas Laser System technology, which offers great potential for high efficiency, electrically-driven, compact, and lightweight high energy lasers for a wide variety of missions of interest to MDA and the Department of Defense.

INTERNATIONAL COOPERATION

As stated in the 2010 Ballistic Missile Defense Review, developing international missile defense capacity is a key aspect of our strategy to counter ballistic missile proliferation. In Europe, we remain committed to working with our NATO allies to make NATO lower layer missile defense assets interoperable with U.S. upper-tier missile defense assets deployed under the EPAA through NATO's territorial missile defense capability. In East Asia, we are improving missile defenses through bilateral relationships. In the Middle East, we continue to work with long-term partners and pursue strengthened cooperation with other countries that have expressed interest in missile defense. MDA is currently engaged in missile defense projects, studies and analyses with over 20 countries, including Australia, the Czech Republic, Denmark, France, Germany, Israel, Japan, Kuwait, NATO, Poland, Romania, Saudi Arabia, South Korea, the United Arab Emirates, and the United Kingdom.

MDA continues its close partnership with Japan on the SM–3 IIA interceptor (Japan is leading the development efforts on the SM–3 IIA second and third stage rocket motors and the nosecone), studying future architectures, and supporting that nation's SM–3 IA flight test program. We also continue collaboration with Israel on the development and employment of several missile defense capabilities that are interoperable with the U.S. BMDS. Last month, at a U.S. test range off the coast of California, the Arrow Weapon System successfully intercepted a target representative of potential ballistic missile threats facing Israel today. We are requesting $106.1 million for Israeli Cooperative Programs (including Arrow System Improvement and the David's Sling Weapon System) in fiscal year 2012. We are working with our partners from the United Arab Emirates on the development of a FMS case for the THAAD system that would represent the first sale of this capability.

Additionally, MDA is actively engaged with the Russian Federation through three missile defense working groups led by the State Department, Office of the Secretary of Defense, and the Joint Staff. We are optimistic from the outcomes of both the NATO Russia Council meeting at Lisbon and the U.S. bilateral working groups that we will make meaningful progress this year in cooperating with the Russian Federation on missile defense, including considering leveraging the combined early warning and surveillance radars of both countries.

CONCLUSION

Our fiscal year 2012 budget funds completing the initial deployment of SRBM, MRBM, IRBM, and ICBM defenses while meeting the warfighters' near-term missile defense development priorities. Subsequently, we will build on that initial capability with the long-term goal of creating an international and enhanced network of integrated BMD capabilities that is flexible, survivable, affordable, and tolerant of uncertainties of estimates of both nation-state and extremist ballistic missile threats.

Thank you, Mr. Chairman. I look forward to answering the committee's questions.

Senator NELSON. Thank you, General, and I want to make it clear that we'll insert all your prepared statements in the record, so if you are able to summarize, as General O'Reilly did, that would be good. Thank you.

Dr. Roberts.

STATEMENT OF BRADLEY H. ROBERTS, PH.D., DEPUTY ASSISTANT SECRETARY OF DEFENSE FOR NUCLEAR AND MISSILE DEFENSE POLICY

Dr. ROBERTS. Thank you, Chairman Nelson, Ranking Member Sessions, members of the subcommittee. I'm grateful for the opportunity to be here today and look forward to your questions. I just have a brief oral statement. The written statement begins with a review of the scope and conclusions of the BMDR, with the hope that that might be of general interest to this subcommittee. But my focus here today is on the key issues that have emerged in our dialogue as we have shifted from the phase that was policy development to policy implementation.

From my perspective, there have been four main issues in discussion between us of a policy kind. The first relates to developments in the threat. In the missile defense review we made a commitment to closely monitor developments in the threat and to assess our defense investment priorities in light of new information about the threat. Of course, in the last year we've had a lot of new information that simply reconfirms the fact that we have an accelerating development of threat, both quantitatively and qualitatively, and this new information has simply reinforced the commitment, our commitment as reflected in the missile defense review, to a balanced approach that ensures that we continue to improve protection of the Homeland while at the same time accelerating regional protection.

The second main issue that's been of continuing discussion among us relates to Homeland defense. In the missile defense review we made the commitment to firstly continue to improve our GMD of the Homeland in order to, in your words, stay ahead of the threat as it develops, and to keep ahead over the long term. But we made a related commitment to be well-hedged, and we've had some continuing discussion about what that means.

I would emphasize that we made a series of commitments in the last budget and some new commitments in the current budget to take steps to continue to improve the performance of the GMD system. Enhanced performance of the system can add future capability in meeting quantitative and qualitative threat developments clearly.

But the focus of discussion has been about the hedge. What is it, first of all, we seek to hedge against? In shorthand, it's the appearance of a second generation threat before we're ready for it.

Now, what does that mean? The posture we have today is one that has us well-protected against the initial ICBMs that might be deployed by states like North Korea and Iran, that are few in number, relatively slow, and lack sophisticated countermeasures. Against this threat we have the current posture of 30 GBIs and the expected enhancements to come in the defense of the Homeland with the future deployment in the 2020 timeframe of SM–3 IIB.

The hedge problem is what happens if we have a number of ICBMs deployed by states like North Korea, Iran, or sophisticated ICBMs with sophisticated countermeasures before the availability of the SM–3 IIB to enhance the protection of the Homeland? For that problem, we have already taken steps to hedge, as reflected in the BMDR, principally providing additional silos into which we could place additional GBIs if required to do so. This year we took the additional step of mothballing rather than decommissioning some additional number of silos so that when that's implemented we would have the ability to increase from 30 to 44, roughly 50 percent, the number of GBIs as a part of the hedge posture. We've also committed to maintaining development of the two-stage GBI as a part of this hedge.

The question that we've been engaged with now internally in DOD for a few months is what more do we need to do to ensure that the hedge posture is sufficient to deal with the possible threat developments in the timeframe before 2020? As we've stated in various venues, we're committed to bring that work forward to you as soon as our Secretary is satisfied that it's complete, and we expect to do so soon.

The third topic of continuing discussion between us has been on implementing the PAA. Our attention has naturally been attracted to Europe because this is the approach that attracted the most political discussion and required the biggest push over the last year politically. But this is a global approach to the regions and one that has to be tailored to each of the regions.

In a general summary, General O'Reilly has already given you good detail on the technical aspects of this. But our first priority in implementing PAA is to ensure that we are growing the capabilities that are available that are relocatable and flexible and adaptive to the different security environments. So we've been ramping up procurement in order to meet the rising demands of the combatant commands (COCOMs), and politically we've been working within the multilateral framework at NATO, bilaterally with our allies in East Asia and elsewhere, to define needed next steps.

Lastly, the fourth issue I'd like to touch on relates to expanding international cooperation. This is again a global agenda from our perspective, but our focus here today, I think, is on Russia. You've posed some specific questions there. We believe, as I think you do, in the potential benefits of cooperation with Russia. We believe also in the potential risks.

We see the benefits as potentially significant for the United States, for the European security environment, and for NATO, but also for Russia. We're mindful of the challenges. We reject cooperation that would in any way limit our missile defenses. You know the shorthand: NATO will defend NATO, but Russia will defend

Russia, and we will seek to reinforce each other's defense where there's mutual benefit in doing so.

We will not compromise essential technologies. There's no discussion of sharing hit-to-kill with Russia. We have made clear that cooperation will require successful conclusion of the defense technology cooperation agreement. This has been under discussion with Russia since it was proposed by the Bush administration in 2004. We've also made it clear that any classified information that's required for discussion with the Russians on this topic would only be discussed after thorough review under our national disclosure policy.

So we hope that we're being mindful of the risks while being clear about the opportunities. We're working two parallel paths: the NATO-Russia Council pathway with Russia, where we are exploring the possibility of cooperative systems in defense of common spaces, where we've resumed the theater missile defense cooperation that was being pursued under the Bush administration and where we're developing a joint analysis for a future framework of cooperative activities.

Bilaterally, we're also working to pursue parallel work on a joint analysis in order to better understand the capabilities we would each contribute and on the defense technology cooperation agreement.

With that, let me close my opening remarks and look forward to your questions.

[The prepared statement of Dr. Roberts follows:]

PREPARED STATEMENT BY DR. BRAD ROBERTS

Chairman Nelson, Ranking Member Sessions, and members of the subcommittee, thank you for the opportunity to testify on the Department's ballistic missile defense (BMD) programs. BMD is a key strategic issue for the United States and I look forward to testifying and answering your questions about our policies and plans.

THE 2010 BALLISTIC MISSILE DEFENSE REVIEW

A year has passed since the Obama administration released its review of BMD policy. It is important to recall that this was the first ever comprehensive review of BMD policy and that it was undertaken with congressional direction in order to inform our national debate about policies, strategies, plans, and programs. As we continue to work within the framework set out in that report, it is useful here to recall its main elements.

The review began with an assessment of the ballistic missile threat. Among its key findings were the following:

- The threat is increasing both quantitatively and qualitatively and is likely to continue to do so over the coming decade.
- Several States are developing nuclear, chemical, and/or biological warheads for their missiles and may attempt to use the resulting capabilities for military advantage in conflict but also to coerce States near and far.
- Regional actors such as North Korea and Iran continue to develop long-range missiles that will be threatening to the United States. There is some uncertainty about when and how this type of intercontinental ballistic missile (ICBM) threat to the U.S. Homeland will mature.
- But there is no uncertainty about the existence of regional missile threats. They are clear and present and increasing at a particularly rapid pace.
- Although confident predictions about the future of the threat are difficult to make, there are some clear trends. These include the progress from short- to longer-range missiles and an increasingly open market in technologies, materials, and expertise. There is also the troubling possibility that non-state actors might acquire weapons of mass destruction and the means to deliver them.

We drew two key conclusions from this threat analysis. First, U.S. defense investments must be balanced in a way that enables the effective defense of the U.S. homeland and of U.S. forces, allies, and partners overseas in both the near and long term. Second, our defensive capabilities must be adaptable to unexpected threat developments. Threats may mature more rapidly or more slowly than predicted, may appear in unexpected locations, or may involve novel technologies or concepts of operations. It is essential that the United States be well hedged and has a strong posture against unpredicted threat developments.

The Review identified the administration's main policy priorities.

1. The United States will continue to defend the homeland from limited ballistic missile attack. These efforts are focused on protecting the homeland from a ballistic missile attack by a regional actor such as North Korea or Iran. The U.S. Homeland is currently protected against limited threats and possesses a capacity to counter the projected threats from these States. But the United States must maintain this advantageous position as the threat matures. Through our continued commitment to maintain and develop the Ground-based Midcourse Defense (GMD) system, the United States seeks to dissuade such States from developing an ICBM, deter them from using an ICBM if they develop or acquire such a capability, and defeat an ICBM attack by States if deterrence fails.
2. The United States will defend against regional missile threats to U.S. forces, while protecting allies and partners—and enabling them to defend themselves. Regional approaches must be tailored to the unique deterrence and defense requirements of each region, which vary considerably in their geography, in the history and character of the threat, and in the military-to-military relationships on which to build cooperative missile defenses. The review reflected our commitment to strengthen regional deterrence architectures with missile defense. It also set out the phased adaptive approach to regional missile defense. It is phased in that it will incorporate improving U.S. capabilities as they become available. It is adaptive in that it is tailored to unique regional requirements and opportunities. Because the demand for missile defense assets within each region over the next decade will exceed supply, we must focus on developing capabilities that are mobile and relocatable.
3. Before new capabilities are deployed, they must undergo testing that enables assessment under realistic operational conditions. This commitment reflected our assessment that it is no longer necessary to pursue a high-risk acquisition strategy that simultaneously develops and deploys new systems. The Integrated Master Test Plan announced in June 2009, and updated every 6 months since, reflects the Missile Defense Agency's new approach.
4. New capabilities must be fiscally sustainable over the long term. This commitment reflects our leadership's assessment that tough decisions must be made to ensure the long-term viability of the investment program. As such, we are pursuing lower-cost interceptors and enabling early intercepts to minimize the inventory required to negate a missile launch. The more constrained fiscal environment has only reinforced our sense of resolve on this matter.
5. BMD capabilities must be flexible enough to adapt as threats change. This conclusion derives from the threat assessment described above.
6. The United States will seek to lead expanded international efforts for missile defense. This is essential to the implementation of the phased, adaptive approach to regional missile defense. More broadly, it supports the objective of creating an environment in which the development, acquisition, deployment, and use of ballistic missiles by regional adversaries can be deterred.

BALLISTIC MISSILE DEFENSE REVIEW IMPLEMENTATION

Over the last year, our focus has shifted from policy formulation to policy implementation. In the continuing executive-legislative discussion of implementation, four key issues have emerged, and I will address each in turn.

1. Monitoring the threat: the Ballistic Missile Defense Review (BMDR) expressed a commitment to maintain a strong focus on threat developments and to rigorously assess defense planning in light of new information. What have we learned?
2. Protecting the Homeland: the BMDR expressed a commitment to continue to improve the GMD system in order to maintain the currently advantageous offense-defense balance against limited strikes, and to be well hedged against threat developments. What additional steps are needed at this time?
3. Pursuing phased adaptive regional missile defense: the BMDR expressed a commitment to deploy the phased adaptive approach in Europe and apply the

approach in East Asia and the Middle East. How much progress has been made?

4. Seeking expanded international cooperation: the BMDR expressed a commitment to lead expanded international efforts for missile defense. This includes a commitment to work to establish a cooperative BMD relationship with Russia. What opportunities and challenges have emerged?

MONITORING THE THREAT

The last year has brought abundant confirmation that the threat is continuing to grow quantitatively and qualitatively. A central focus remains on Iran and North Korea as sources of potential threat to the United States and to our allies. In addition, a number of States are developing or acquiring Anti-Access/Area Denial capabilities such as anti-ship cruise missiles or anti-ship ballistic missiles. These capabilities are intended to deny our forces access to key regions, and to blunt the operations of forces that do deploy forward.

Iran already possesses the largest inventory of ballistic missiles in the Middle East, and is developing more of them. In addition to its growing missile and rocket inventories, Iran is boosting the lethality and effectiveness of those stockpiles, through accuracy improvements, new submunitions, and salvo launch capabilities. Furthermore, Iran's Simorgh space-launch vehicle shows that Iran is making the technological progress needed for the development of an ICBM.

Iran also shows continued interest in pursuing its nuclear-related programs, though the Obama administration's economic sanctions program has clearly begun to bite more deeply than the present regime might have expected. Although we do not know if Iran will eventually decide to build nuclear weapons, the prospect of a nuclear-armed Iran is deeply concerning to the United States and the global community, and there is a risk that Iran's continued efforts along these lines may prompt neighboring States to pursue national nuclear programs.

North Korea is modernizing every aspect of its deployed missile forces—including short-, medium-, and intermediate-range systems. It has reinforced its long-range artillery forces near the DMZ with a substantial number of mobile ballistic missiles that could strike targets in South Korea, Japan, and U.S. bases in the Pacific. North Korea has not successfully tested an ICBM, but we expect it to continue to test-launch missiles, including the Taepo Dong-2 (TD–2). With further TD–2 tests, North Korea may develop an ICBM capable of reaching the United States. In addition, Pyongyang has a long history of ballistic-missile proliferation, and likely will continue to market and potentially export missile technologies to a number of countries—including Iran and Syria.

North Korea's nuclear-weapons program only increases our concerns about that nation's missile capability. According to the Director of the Defense Intelligence Agency, "The North may now have several plutonium-based nuclear warheads that it can deliver by ballistic missiles and aircraft as well as by unconventional means."

The ballistic-missile threat from North Korea is especially relevant in light of recent provocative behavior by the regime. A multinational Joint Civilian-Military Investigation Team concluded that a North Korean midget submarine sank South Korea's naval corvette Cheonan on March 26, 2010 near the contentious Northern Limit Line in the West Sea, causing the loss of 46 South Korean sailors. Then, in the first attack against a civilian-inhabited area since the Korean War, North Korea shelled Yonpyong Island on November 23, killing two South Korean marines and two civilians.

These assessments reinforce the administration's commitment to a balanced approach that continues to improve the defense of the homeland while also accelerating protection against regional threats.

DEFENDING THE HOMELAND

As noted above, the BMDR expressed a commitment to continue to improve the GMD system in order to maintain the currently advantageous offense-defense balance against limited strikes, and to be well hedged against threat developments. What additional steps are needed at this time?

The assessment that the United States is currently protected against limited strikes derives from the strength of the current posture against the current threat to the homeland. Today, the United States is protected against limited ICBM attacks as a result of investments made over the past decade in the GMD system. Thirty Ground-Based Interceptors (GBIs) are now deployed to defend the homeland. To enable successful intercepts by these missiles, radars are now in place in Alaska, California, Greenland, and the United Kingdom. They are also deployed at sea aboard Aegis destroyers and cruisers, at Shariki, Japan, and in the form of the Sea-

based X-band radar. These capabilities are enabled by a sophisticated command and control infrastructure. Looking to the future, this posture will provide continued protection against initial ICBM deployments.

The commitment to continue to improve the GMD system is reflected in a number of ongoing activities and in the associated fiscal year 2012 budget. We continue to:

- Test and upgrade the system to increase reliability and survivability
- Develop and upgrade Ballistic Missile Defense System sensors
- Procure GBIs (in fiscal year 2012, we will procure five more)
- Implement GBI refurbishment and reliability sustainment programs (in order to sustain the fleet for another two decades)
- Upgrade GMD Fire Control ground system software
- Enhance the Command, Control, Battle Management and Communications system to handle larger raid sizes
- Develop and deploy new sensors in a variety of settings—including forward bases in Europe, unmanned vehicles in the skies, and platforms in space
- Develop early-intercept concepts to help defeat countermeasures and reduce the inventory required to negate missile launches

Additionally, we are developing the Standard Missile-3 (SM–3) Block IIB for deployment against future IRBM and ICBM threats in the regional defense architectures (as discussed further below), which is an important part of the long-term defense against future ICBM threats to the homeland.

The performance of the GMD system will also be strengthened with new investments that will result in better sensor information reaching the GBI during its flight. The fiscal year 2012 budget includes new funding for an In Flight Interceptor Communications System Data Terminal on the East Coast and for upgrades to the Early Warning Radars at Clear, AK, and Cape Cod, MA. Looking to the longer term, the administration is also investing to develop next generation missile defense capabilities. This includes continued work to research the potential of directed energy systems for missile defense.

We are sustaining these commitments even as the Department has identified efficiencies and cuts as a result of government-wide budget limitations.

These capability enhancements will contribute significantly to preservation of the currently advantageous posture of the United States against limited strikes if or as ICBM threats develop from Iran and North Korea, or other regional threats. But they may not be enough. The United States must also be well hedged against the possibility that threats might evolve more rapidly than planned capability enhancements. It must also be well hedged against the possibility that those capability enhancements may be delayed for technical reasons. After all, development programs involve inherent technical risk.

To strengthen the U.S. hedge posture, the administration has taken the following steps:

- Construction of Missile Field 2 at Fort Greely, AK, is being completed in a 14-silo configuration to accommodate a contingency deployment of eight additional GBIs if needed.
- Six GBI silos at Missile Field 1 at Fort Greely are being mothballed instead of decommissioned, allowing their return to service within 2 years if necessary; and
- Testing and assessment of a two-stage Ground-Based Interceptor is continuing in order to preserve future deployment options.

The administration is considering additional steps to strengthen the U.S. hedge posture. We have been studying threat developments, future capabilities, and deployment options for a range of scenarios. We have been evaluating the deployment timelines associated with fielding additional capabilities with an eye to enabling rapid responses to triggering events. Our objective is to enable aggregate improvements that increase probability of kill, raid capacity, and battle space. This work involves a significant amount of classified information from both the intelligence community and the system developers. We have committed to brief this subcommittee on the results in a classified setting in the next several weeks.

A key issue of continuing congressional interest is the role of the two-stage GBI in the hedge strategy. The BMDR explicitly recognized this role. The classified analysis addresses this matter directly, as well as the continued role of GBIs more generally. DOD will ensure that it preserves the capacity to provide additional GBIs to missile field two and possibly missile field one should such decisions be taken in the future. As General O'Reilly said in his testimony before the House Armed Services Committee on March 31, several of the assumptions we used to arrive at a total purchase of 52 GBIs are no longer valid, primarily due to test failures and the need

for additional testing. Some increased number of GBIs that will be necessary, but we must conclude the investigation of the most recent test failure before we can make a determination about the number of additional GBIs that will be required. The decision to procure five additional GBIs, together with the ongoing refurbishment program, will keep GBI production lines warm for several years. This in effect provides us with additional decision time to procure additional GBIs without letting the production lines go cold.

PURSUING PHASED ADAPTIVE REGIONAL MISSILE DEFENSE

The BMDR expressed a commitment to deploy the phased adaptive approach (PAA) in Europe and apply the approach in East Asia and the Middle East. How much progress has been made? In brief, the progress has been significant.

Required Capabilities

To support PAA implementation, we are procuring a pool of missile defense assets that will allow us to address current regional threats and surge missile defenses into troubled regions in a time of political-military crisis. To date, MDA has delivered two THAAD batteries and seven AN/TPY–2 radars. By the end of fiscal year 2012, a total of 29 Aegis ships will have BMD capability and there will be a total of 15 U.S. PAC–3 battalions. The fiscal year 2012 budget continues the procurement of additional THAAD batteries, forward-based radars, as well as the conversion of additional Aegis ships, and SM–3 interceptors. This commitment to additional regional capabilities will allow for increasingly robust regional architectures over the decade.

Europe

The BMDR set out the main elements of the application of the phased adaptive approach in Europe. The European Phased Adaptive Approach (EPAA) is phased to incorporate improving U.S. capabilities and adaptive to the particular geopolitical landscape of Europe. The Obama administration is committed to the deployment of all four phases. Toward that end, it has begun to deploy initial capabilities. It has also developed a diplomatic strategy with allies and partners in Europe.

The first deployment of EPAA capabilities came on March 7 when the guided missile cruiser USS *Monterey*, carrying SM–3 Block IA interceptors, deployed to Europe. This deployment is supported by other decisions within a comprehensive force management process, led by the Joint Staff, that adjudicates competing requirements from the combatant commands.

We are currently in discussions with potential host nations for the deployment of an AN/TPY–2 forward-based radar to southeastern Europe. While no decision has been made, we expect to meet our 2011 deployment timeline. Looking ahead to Phase 2 in 2015 and the deployment of land-based SM–3 interceptors in southeastern Europe, Romania has agreed to host the site. Looking further ahead to Phase 3 in 2018, Poland has agreed to host the second land-based SM–3 site.

Within the North Atlantic Treaty Organization (NATO), considerable progress has also been achieved. This past November at the Lisbon Summit, NATO's leaders took the unprecedented step of deciding to pursue full coverage and protection for the Alliance's populations, territories, and forces in Europe against ballistic missile attacks. NATO also decided at Lisbon to expand its existing missile defense command and control backbone—the Active Layered Theater Ballistic Missile Defense—to encompass territorial missile defense, which will make current and future Alliance missile-defense assets interoperable. These decisions send a strong signal that NATO will not allow itself to be defenseless against ballistic missile coercion or attack.

Other Regions

The same basic approach is being pursued in East Asia and the Middle East, but in a way that is tailored to the existing foundations of cooperation and unique regional requirements. Capabilities will be phased in as they become available for deployment, but in a manner adapted to specific regional circumstances.

In East Asia, a strong foundation of missile defense capabilities and cooperation already exists. The U.S. deploys Aegis BMD-capable ships in the region. Japan has a layered missile defense system that includes Aegis BMD ships with SM–3 interceptors, PAC–3 fire units, early-warning radars, and a command-and-control system. Japan also hosts an AN/TPY–2 radar. U.S. and Japanese forces regularly train together and have successfully executed simulated cooperative BMD operations. We are also engaged in cooperative development of the next generation SM–3 Block IIA interceptor, which is projected to enter service in 2018.

Australia participates in our Trilateral Missile Defense Forum with Japan, and takes part in the Nimble Titan missile-defense exercise series hosted by U.S. Strategic Command. Australia is also acquiring ships that would be compatible with U.S. Aegis BMD systems, should they choose to pursue that capability.

With South Korea, we have engaged in bilateral missile-defense cooperation discussions and have recently signed a Terms of Reference and an agreement that will enable our two nations to carry out a requirements analysis so that South Korea can make informed decisions about the utility of any future BMD program.

One of the key differences between East Asia and Europe is the absence of a multilateral alliance framework based on collective defense. Thus our plans to strengthen the regional missile defense architecture have had to be built on the foundations of bilateral cooperation and a variety of security interests and perceptions.

The administration has also sought dialogue with China on BMD, with little success. We have sought to explain U.S. intentions and capabilities and also to better understand China's concerns that such defenses might negate China's strategic deterrent. We have also sought to convey longstanding U.S. concerns about the pace and scope of China's current military modernization efforts, which encompass a wide range of advanced air, air-defense, naval, missile, space and cyberspace capabilities. We believe that such a dialogue could help to reduce mistrust, enhance mutual understanding, and broaden cooperation. China deploys a limited but growing number of conventionally armed, medium-range ballistic missiles, and it likely is nearing deployment of a medium-range anti-ship ballistic missile. It has more than 1,000 conventional short-range ballistic missiles opposite Taiwan for a variety of precision-strike missions. China is also forming more missile units, upgrading some older missile systems, and developing methods to penetrate missile defenses.

In the Middle East as in East Asia, the absence of a multilateral security framework means that the regional approach must be built on the foundation of bilateral relationships.

In the Persian Gulf, the United States maintains a robust mix of missile-defense assets to protect our troops and facilities in the region. We have built a series of bilateral missile defense agreements with the Nations of the Gulf Cooperation Council (GCC) to address the regional ballistic missile threat from Iran. U.S. Central Command continues to work on establishing air defense and missile defense architectures for the GCC nations. In addition, the United States has approved the sale of Patriot and THAAD systems to the United Arab Emirates. We are also working with Saudi Arabia to refurbish its Patriot systems and recertify the interceptors for those systems.

We have also taken steps to ensure that Israel will remain capable of countering the full range of Iranian ballistic missile threats that may emerge. In doing so, we have built on a longstanding relationship with Israel on BMD. In addition to conducting major missile-defense exercises over the last several years, the United States and Israel meet regularly and coordinate extensively on a range of missile-defense programs, including the Arrow weapon system and a new program for defeating short-range ballistic missiles, known as David's Sling, as well as various other shared plans and operations.

In both East Asia and the Middle East, new capabilities will be phased in as appropriate to address regional threats, and as they become available through the comprehensive joint force management process identified above. This will help to ensure that the requirements of the different combatant commands are met in a responsible manner as additional asserts become available.

Seeking Expanded International Cooperation

The BMDR expressed a commitment to lead expanded international efforts for missile defense. The intent here is global—to work with allies and partners generally to strengthen cooperation. A key priority is to establish a cooperative BMD relationship with Russia. Significant opportunities have emerged, along with some challenges.

Our pursuit of missile defense cooperation with Russia occurs against the backdrop of broader changes in U.S.-Russian relations. Over the past year, there has been important progress in these relations such as ratification and entry into force of the New START Treaty, the joint pressure applied to Iran's nuclear program, and new steps to strengthen the NATO-Russia Council. Russia's leaders have accepted proposals from the United States and NATO to pursue cooperation on missile defense to enhance our common security against common threats and as part of the broader re-set of U.S.-Russia relations.

Cooperation with Russia on missile defense would be significant for a number of reasons. Cooperation could offer tangible security benefits to Europe, Russia, and the United States in the form of stronger protection against missile threats than

would be possible if pursued separately. Most significantly, by beginning missile defense cooperation now, Russia, the United States and NATO will gain information, experience, and confidence that will strengthen strategic stability and help to shape and bring closer together our security strategies.

Officials from the Department of Defense and Russian Ministry of Defense have been working to initiate a joint analysis of opportunities for enhanced missile defense cooperation. In addition to our bilateral efforts, NATO and Russia agreed to resume missile defense cooperation, and to study ways in which we might cooperate on territorial missile defense in Europe.

As President Obama has stated, we are pursuing BMD cooperation "even as we have made clear that the system we intend to pursue with Russia will not be a joint system, and it will not in any way limit United States' or NATO's missile defense capabilities." NATO alone will be responsible for defense of NATO territory, just as Russia should be responsible for defense of Russian territory. We would operate our respective systems independently but cooperatively, in a way that reinforces their performance without putting them at risk.

A requirement for the safeguarding of sensitive information in support of cooperation is a Defense Technology Cooperation (DTC) Agreement, which will provide the legal framework for undertaking cooperative efforts. The proposed DTC Agreement (which we began to negotiate in 2004) contains an annex that addresses the sharing of classified information. But this on its own will not constitute authorization to provide classified information to Russia. Exchange of classified information with Russia would still be subject to U.S. National Disclosure Policy and the associated careful review, just as it is with other partners.

Expectations for cooperation with Russia are running high, but it is important to be realistic about both the opportunities and challenges ahead. That said, I do believe we have an opportunity for meaningful cooperation that will enhance the security of the United States, our NATO allies, and Russia.

CONCLUSION

A year after release of the BMDR, implementation is well launched. Capabilities are in place to protect the homeland from limited attack, and steps are being taken to continue to improve those capabilities. Capabilities are also in place to protect U.S. forces, their families, and our allies from regional attacks, and the first steps have been taken to implement the phased adaptive approach. We have put in place investment programs aligned with our policy priorities.

We have also tried to put in place the political foundations for a long-term commitment by the United States in this area, building on the important work of our predecessors. Missile defense is a long-term challenge that requires sustained support from a succession of administrations and Congresses. As Secretary Gates has argued, "The protection of the United States from the threat of ballistic missile attack is a critical national security priority. The threat to our deployed military forces and to our allies and partners is growing rapidly. This threat has significant implications for our ability to project power abroad, to prevent future conflicts, and to prevail should deterrence fail."

I am grateful for the opportunity to be here today to make our case for your support and I look forward to your questions.

Senator NELSON. Thank you.

Admiral Macy.

STATEMENT OF RADM ARCHER M. MACY, JR., USN, DIRECTOR, JOINT INTEGRATED AIR AND MISSILE DEFENSE ORGANIZATION, THE JOINT STAFF

Admiral MACY. Thank you, sir. Good afternoon, Mr. Chairman, ranking member, and members of the subcommittee. I appreciate the opportunity to testify on the JIAMDO and our contribution to BMD. Let me also take a moment here to thank you both for your comments on my behalf, and I very much appreciate your attention and the opportunity to work with this subcommittee over the last 2 years. It's been truly a pleasure.

JIAMDO supports the Chairman of the Joint Chiefs of Staff, the Joint Staff, and the combatant commanders. Our mission is to identify and coordinate joint requirements for air defense, cruise

missile defense, and BMD to support the development of solutions, to deliver capabilities for the warfighter. We provide expertise, analysis, planning, and coordination across the combatant commanders and the Services in a number of vital efforts relative to both air threat and BMD. These include advocating for the warfighters' desired air and missile defense capabilities, where we facilitate COCOMs and Services' collaborative efforts to identify and develop operational concepts, joint requirements, system interoperability, and operational architectures for integrated air and missile defense.

We provide support to the Commander, U.S. Strategic Command (STRATCOM), in his role as the air and missile defense integrating authority. We provide support for, and interaction with, other elements of the Joint Staff for global force management of the high-demand, low-density BMD assets and systems.

We represent the United States to NATO for matters of air and missile defense policy and planning, and we conduct assessment, analysis, and validation of integrated air and missile defense capabilities to inform both warfighter planning and system development and acquisition.

The Chairman has directed JIAMDO to be at the intersection of the requirements processes for air defense and BMD and to act as an integration mechanism for harmonizing both common and differing needs across multiple services, platforms, and systems. Several recent JIAMDO key activities in BMD capability development highlight this integration responsibility. These include follow-on efforts from the BMDR, initial steps in fielding the EPAA, and conducting the JCM–III study that the chairman referred to earlier.

During the BMDR, completed approximately a year ago, I was one of the three co-directors of the review, which holistically assessed U.S. BMD policy and strategy. Since that time, JIAMDO serves as a nexus within the Joint Staff for tracking and enabling implementation of the recommendations and characteristics of the BMDR report and, critically, providing support to the COCOMs and the interagency in fulfilling the goals of that review.

These efforts have included examining how BMD capability needs fit into DOD's global force management processes to apportion, allocate, and assign BMD elements in a process to adjudicate competing COCOM requirements.

As the Director of JIAMDO, I am the U.S. representative to the NATO Air Defense Committee, responsible for addressing air and missile defense-related issues in NATO and for drafting and coordinating U.S. positions. In this role, I have the privilege of working with the NATO staff and member countries to discuss the application and implementation of the PAA in Europe and the potential for regional missile defense capability in a NATO context.

As was mentioned already, the first BMDS element deployment in support of phase 1 EPAA capability occurred on March 7 of this year when the cruiser USS *Monterey* deployed to Europe. Two weeks ago, the permanent representatives to the North Atlantic Council, the NATO Military Committee, the NATO Air Defense Committee, and other NATO senior policy and technical committees and international staff received tours and demonstrations aboard the ship during a port call on Antwerp. For the rest of this

year, *Monterey* will spend the spring and summer helping to develop, test, and verify the command and control processes, the data pathways, tactics, techniques, and procedures necessary for the phase 1 capability to become operational later this year.

In the course of this, two areas have become clear in my dealings with the allied nations. First is the criticality of being able to integrate partner nations into the missile defense architecture and structure through networking. This builds coalition unity and provides other nations the opportunity to actively participate in both their own defense and a larger collaborative defense, and results in shared responsibility and costs.

Second is the value of satellite systems, such as the STSS, to provide a means to rapidly increase the level of protection in designated areas or extend protection to an undefended area. This is an unprecedented level of flexibility and responsiveness for combatant commanders to offer their allied partners should the need arise.

Finally, as was mentioned, JIAMDO recently completed the base case in the third of a series of air and missile defense inventory sufficiency analyses called the JCM–III study, to examine the implications and opportunities for the PAA to our overall capability for BMD. This study has been reviewed by DOD. We're in the process of briefing the base case results to appropriate parties, including this committee, and we are continuing the analytic efforts of JCM–III to examine a number of excursions and alternatives that we have developed.

The JCM–III study assesses warfighters' requirements for BMD elements for the Homeland and for each of the European, Central, and Pacific Commands' areas of responsibility (AOR) as the commanders anticipate using BMD capabilities within their overall operational planning. Working with the COCOMs, the Services, and the MDA, we looked to understand how many interceptors, launchers, and sensors were needed to counter various future scenarios and, most critically, the effect those numbers had on warfighting capability. We took into account how the COCOMs intend to employ the BMD elements, their desire for a layered defense, what the threats are, and generally how the threat will be expected to be employed.

The significant level of warfighter and developer involvement in the process gives us a high level of confidence in the results. It also shows that the development programs are correctly focused on warfighters' desires for forward-based airborne and satellite systems that enable earlier intercepts, larger engagement areas, more shot opportunities, and increased effectiveness against countermeasures.

You may remember that we previously conducted JCM–I in 2005 and 2006 and JCM–II in 2007 and 2008. These focused on the number of interceptors that might be required under different scenarios against specific threats. There are three main differences between these earlier studies and JCM–III.

First, JCM–III examines all the elements of the regional BMDS, including sensor systems, launcher systems, and interceptors, whereas the previous studies looked only at interceptors.

Second, JCM–III examines performance against threat ballistic missiles that employ a range of countermeasures. We had not done this previously.

Third, as I have previously noted, JCM–III is a study of warfighting sufficiency rather than inventory acquisition objectives. We examine the ability of the application of PAA architectures in the different AORs of the COCOMs and for the defense of the Homeland to determine how BMDS contributes to their overall plan to deter aggressors and, if necessary, to end enemy ballistic missile attacks should they occur. We do not attempt to simply answer how much to buy. We give alternatives to the warfighter on how to achieve his overall warfighting goals.

The specific study results cannot be discussed in this open forum, but I'm prepared to discuss the classified results in a closed session following our time this afternoon or at another time at the subcommittee's convenience or that of the individual Members.

Overall, JIAMDO continues to provide the Joint Staff and the combatant commanders a linchpin resource for the development, refinement, planning, and fielding of, among other things, BMD for our Homeland, our deployed forces, citizens, partners, and friends overseas.

Thank you, Mr. Chairman and Mr. Ranking Member for the opportunity to testify. I look forward to answering your questions.

[The prepared statement of Admiral Macy follows:]

PREPARED STATEMENT BY RADM ARCHER M. MACY, USN

Thank you, Chairman Nelson, Senator Sessions, and distinguished members of the subcommittee. I appreciate the opportunity to testify. It is an honor and pleasure to join Dr. Roberts, LTG O'Reilly, and Ms. Chaplain to discuss ballistic missile defense (BMD) and inform you how the Joint Staff and the Joint Integrated Air and Missile Defense Organization (JIAMDO) contributes to this important mission area.

JOINT INTEGRATED AIR AND MISSILE DEFENSE ORGANIZATION AS A PART OF THE JOINT STAFF

As a reminder, JIAMDO supports the Chairman of the Joint Chiefs of Staff, the Joint Staff, and the combatant commanders. Our mission is to identify and coordinate joint requirements to support efforts developing air defense, cruise missile defense, and BMD solutions for the warfighter.

We are a Chairman's Controlled Activity tailored to provide current operational expertise in air and missile defense and our members are drawn from across the Services. The background and experience of these military experts allows them to relate at an operational level with the warfighter and enables them to translate operational needs into requirements documents, analysis and study activities, and demonstrations.

JOINT INTEGRATED AIR AND MISSILE DEFENSE ORGANIZATION'S KEY CONTRIBUTIONS TO BALLISTIC MISSILE DEFENSE

In support of the Chairman and the Joint Staff, JIAMDO provides expertise, analysis, planning, and coordination across the combatant commanders and the Services in a number of vital efforts relative to BMD. These include participating in, and following up on the results of, the Ballistic Missile Defense Review (BMDR) that concluded last year; support for BMD weapon system fielding processes; support to U.S. Strategic Command (STRATCOM) as the Air and Missile Defense Integrating Authority; support for and interaction with other elements of the Joint Staff for Global Force Management of High Demand/Low Density BMD assets and systems; representing the United States to North Atlantic Treaty Organization (NATO) for matters of air and missile defense policy and planning; and Integrated Air and Missile Defense Assessments and Analysis. I'll address each of these briefly, but first I'd like to discuss JIAMDO and the Combatant Commands (COCOMs).

A key part of our contribution is advocacy for the COCOMs. JIAMDO is focused on ensuring the Department is delivering capabilities that support COCOM operational plans and address their air and missile defense gaps. We assist the COCOMs in the Department's annual Capability Gap Assessment process that addresses their critical warfighting capability gaps in their Integrated Priority Lists that identify risk in accomplishing their specific Unified Command Plan missions. In addition to JIAMDO's role in the Joint Staff capabilities processes, we have liaison personnel at U.S. Central Command (CENTCOM), U.S. European Command (EUCOM), STRATCOM, Joint Forces Command, U.S. Pacific Command (PACOM), U.S. Northern Command (NORTHCOM), U.S. North American Aerospace Defense Command, and U.S. Forces, Japan. The liaison provides a direct link between JIAMDO and the COCOMs as they work air and missile defense issues day-to-day for both the hosting command and JIAMDO.

Ballistic Missile Defense Review

JIAMDO had four key roles in the BMDR. As the Director of JIAMDO, I was one of the three directors of the review; other JIAMDO personnel served as co-chair of the Programmatic Process and Execution Working Group; led the Requirements Issue Team; and served in the Directorate of Activities. In short, JIAMDO played a central role in the development of the BMDR. Subsequent to the completion of the Review, we have continued to work with the offices of the Under Secretary of Defense for Policy, the Under Secretary of Defense for Acquisition, Technology and Logistics, the Missile Defense Agency (MDA), the Joint Staff, and members of the Interagency as we develop and advance the principles and policies for BMD, such as the Phased Adaptive Approach (PAA), that were enumerated in the BMDR report.

Ballistic Missile Defense Elements System Fielding

The fielding plan for new missile defense systems developed by MDA identified a need for the department to develop a process to transition and transfer those systems from MDA to the Services. JIAMDO worked closely with Service staffs and MDA to develop business rules and processes to handle this, and was the lead to take the new process to the Joint Requirements Oversight Council (JROC) for approval.

Support to the Air and Missile Defense Integrating Authority

STRATCOM is designated the Air and Missile Defense Integrating Authority (AMD IA) and serves as the COCOMs' representative for air and missile defense. JIAMDO is formally tasked to provide operational expertise and analytic support to the AMD IA as it documents BMD requirements to MDA. Currently, we are assisting in developing the expanded Prioritized Capability List that will provide transparency and insight for Service developers and MDA for missile defense, and a common requirements view for senior decisionmakers.

JIAMDO and Global Force Management

JIAMDO is also assisting the Joint Staff J–3 to formalize the inclusion of Missile Defense in the Global Force Management Process to address the force sourcing and mitigation options for BMD assets. This would assure that, like other high demand/low density assets, missile defense is included in the assignment, allocation, and apportionment process to adjudicate competing COCOM requirements.

JIAMDO and the North Atlantic Treaty Organization

Closely associated with COCOM relationships are the NATO responsibilities of JIAMDO. The Director, JIAMDO is the U.S. Representative to the NATO Air Defense Committee (NADC), responsible for addressing air and missile defense related issues in NATO. The Director's unique position allows insight into policy and military issues from both a U.S. and Alliance point of view, and enables the United States to understand and address tactical level integration of allies and partners in analysis and studies, and during the development of employment concepts. In this regard I have had the privilege of working with the NATO staff and appearing before the North Atlantic Council to discuss the application of the PAA in Europe and the potential for regional missile defense capability in a NATO context. Most recently, the NADC led the senior policy and technical committees from NATO Headquarters on tours and demonstrations on the Aegis BMD ship USS *Monterey* (CG 61).

Integrated Air and Missile Defense Assessments and Analysis

A concurrent responsibility for JIAMDO is assessing and validating operational concepts and architectures, and helping COCOMs and Services define and refine air

and missile defense requirements. This is performed primarily through studies and analyses, modeling and simulation, and the conduct of wargames. Study activities vary from inventory analysis to examinations of surveillance coverage and options for various mixes of surveillance sensors. JIAMDO recently completed the third of a series of quantitative performance analyses, the Joint Capability Mix III (JCM III) Study, to determine the warfighter requirements for elements of the BMD System required for BMD; I will discuss this in some more detail later in my testimony.

A centerpiece of JIAMDO's analysis is the Nimble Fire modeling and simulation activity. Nimble Fire is a classified operator-in-the-loop simulation where Air Force, Navy, Marine Corps, and Army operational personnel come together to simulate the execution of joint air and missile defense missions. The events are structured to allow operational personnel to employ their systems and forces as they deem appropriate and the data we obtain is used to define and refine capability gaps, requirements, concepts, and in some instances employment techniques. It is a fully functional joint architecture capable of executing current and future concepts with operationally representative positions for Aegis, Patriot, Airborne Warning and Control System, E–2, F/A–18, F–15, F–22, and JLENS among others. The simulation can conduct distributed operations to U.S. and overseas military locations and annually executes a combined air, cruise missile, and BMD event in conjunction with MDA's Missile Defense Integrated Operations Center simulation at Colorado Springs. Analysis events are based on COCOM war plans and routinely have participants from the commands in the operational positions. Results are out-briefed to the COCOMs as well as the Services and agencies. Nimble Fire is a one-of-a-kind capability that has proven to be invaluable in analyzing concepts and requirements.

JIAMDO also provides analytical support and coordinates COCOM participation and input into two of the premier BMD wargames, Nimble Titan and the Ballistic Missile Defense System (BMDS) Wargame. Nimble Titan is sponsored by STRATCOM and led by the Joint Force Component Command, Integrated Missile Defense (JFCC IMD). It is a policy and military wargame designed to assess and evaluate coalition and allied participation in missile defense. U.S. and international missile defense experts from both ministries of foreign affairs and ministries of defense take part in the events. Eight nations currently participate, with more countries to be added in 2012. Insights from these wargames allow the U.S. and its partners to identify potential policy and military issues such as command and control, information sharing, and coalition decisionmaking. The BMDS Wargame, sponsored by MDA, is a U.S.-only classified tactical level simulation that brings together warfighters and developers to collaboratively examine the optimal employment of the future BMDS. This wargame explores areas such as shot doctrine, sensor control, interceptor inventory management, and force employment. JIAMDO leverages findings from these events to support other analyses, and used the shot doctrine developed during the BMDS wargame in the models for the JCM studies.

The Department has recognized that air and missile defense is a complex mission area and has committed to joint warfighting. JIAMDO is part of that commitment and we are working hard to ensure that warfighter needs are met. I would next like to discuss the PAA for BMD as mentioned earlier.

THE PHASED ADAPTIVE APPROACH CONCEPT

The concept of a PAA to missile defense was an outgrowth of the BMDR, which took a holistic look at the different aspects of our missile defense strategy and its programs. These ranged from trends in threat development, U.S. missile defense technology development, operational fielding needs and opportunities, and capability requirements from COCOM war plans. The particular focus of PAA is the regional missile threat coming from short-, medium-, and intermediate-range ballistic missiles and is responsive to both congressional direction, and the warfighters' needs, to place more emphasis on these types of threats. In short, it is a more effective and efficient approach to missile defense. I think it is important to emphasize here that the PAA is not an acquisition program, or a single plan to be applied unchanged across all areas of the globe. It is a conceptual approach to providing BMD capability for our deployed forces, allies and partners, and additional capability for homeland defense, in different regions, circumstances and times.

The recently completed NATO Summit of Heads of State and Governments at Lisbon adopted the new Strategic Concept for NATO, which explicitly affirms that, in the face of " . . . the proliferation of ballistic missiles, which pose a real and growing threat to the Euro-Atlantic area," the Alliance will "develop the capability to defend our populations and territories against ballistic missile attack as a core element of our collective defence, which contributes to the indivisible security of the Alliance."

We view this as a ringing affirmation of the priority to develop missile defense for our European NATO allies and our deployed forces.

I would like to point out that although there has been significant focus and discussion on Europe, the PAA is much more than just the defense of Europe. The PAA concept provides the United States with an enhanced capability to respond to regional threats worldwide, no matter where they emerge, and to strengthen defense of the Homeland. It also provides us with the flexibility to tailor the type and size of that response by being able to adapt to the threats, partners' capabilities, and geography of each region. The PAA is "phased" to advances in our own technical and operational capabilities for BMD, and it is "adaptive" to trends and advances in potential adversary threats. The European version of the PAA has four phases based upon projected advances of our technical capabilities; however, in other COCOM's areas of responsibility (AOR) the number and timing of individual phases will vary based upon their unique circumstances. The geographic COCOMs are developing plans for phases for each AOR, with the European PAA currently being the most advanced.

The PAA has not resulted in a wholesale change in what the Department had previously planned to develop, but it does adjust the timing and quantity of some of the systems. A key enabler for this flexibility is the structured and disciplined approach to development and fielding of the BMDS. MDA is providing the Department with an impressive array of very capable systems that give us the freedom to maneuver and adapt to different and changing environments and threats. To fully capitalize on this range of capabilities, the Joint Capability Mix studies help guide decisions on maximizing COCOM capabilities and provide senior leaders with a risk-relevant assessment based on operational plans. This is a critical effort, particularly in light of the need to maximize every dollar spent. I would now like to address the operational benefits of the PAA.

OPERATIONAL BENEFITS OF PHASED ADAPTIVE APPROACH

As has been noted before, Congress and our warfighters have said the most pressing threat for our deployed forces today is the increasing number of Short-Range Ballistic Missiles (SRBMs) and Medium Range Ballistic Missiles (MRBMs). Without going into classified details, suffice it to say that the sheer number and types of these threats grows daily and the Nation needs to find a way to deal with them. The PAA addresses these issues head on. The United States cannot afford to build the number of launchers, interceptors, and sensors it would take for each COCOM to have his own dedicated BMDS capability that can address all the potential strikes that could be launched. What the PAA provides instead, is a balanced investment that has the capacity to engage the range of threats; can be tailored to the geography, political circumstances, capabilities of regional partners; and has the flexibility to rapidly deploy more assets where and when they are needed.

EUROPEAN PAA PHASE I (2011) INITIAL SHORT-RANGE BALLISTIC MISSILES AND MEDIUM-RANGE BALLISTIC MISSILES CAPABILITY IN EUROPE

European PAA Phase I is focused on the near-term essentials to go against the SRBM and MRBM threats. We are already giving the overseas combatant commanders more of what we already have by increasing the number of Patriot interceptors to complement the existing inventory of Patriot and Aegis with Standard Missile-3 (SM–3). The European PAA Phase I will also add SM–3 Block IA. This is a simple and direct operational counter. As the threat grows, we increase the number of our defensive interceptors. While this is workable to a point, it rapidly becomes unaffordable as the threats continue to grow in numbers over time.

To break out of the spiral of trying to match the threat missile-for-missile, the European PAA Phase I also begins the introduction of operational leverage by placing a forward-based AN/TPY–2 radar in Southern Europe. The addition of this AN/TPY–2 radar will allow the combatant commander to use Aegis to launch interceptors against ballistic missiles tracked by either the ship itself or the AN/TPY–2 radar. This significantly increases the size of the area that can be defended, and we will examine this architecture in a live intercept test mission in the near future. Phase I also includes the Command, Control, Battle Management and Communications (C2BMC) upgrade to the air operations center at Ramstein Air Base, Germany. C2BMC controls the AN/TPY–2 and also ties it and any Aegis ships into our command and control structure in Europe. C2BMC is a major operational leverage point for PAA because it provides the pathway for data exchange throughout a theater and from a theater to the Homeland.

The first BMDS element deployment in support of Phase I European Phased Adaptive Approach (EPAA) capability occurred on March 7, of this year when the

USS *Monterey* (CG 61) deployed to Europe. *Monterey* will spend this spring and summer helping to develop, test, and verify the command and control processes, data pathways, tactics, techniques, and procedures necessary for the Phase I capability to become operational later this year.

This phase is also concurrent with efforts to enhance our capability for Homeland defense with early warning radar upgrades, adding more Ground-Based Interceptors (GBIs) in Alaska, and developing improved GBIs. In the instance of the European PAA the radar tracks from the AN/TPY–2 in Southern Europe will be provided to NATO for defense of the territory and populations of the European members of the Alliance, and will be used by the United States to provide early tracking information to enhance our Homeland defense assets. This linkage enables very efficient management of radar data and missile engagements. C2BMC will ensure threats are detected, tracked, and efficiently engaged. It will both prevent inadvertent "overengagement" where too many shots are taken at an incoming threat; and the worse alternative, "underengagement" where no shots are taken, because each shooter is operating independently. The operational bottom line on Phase I is that it gets us greater ability to engage the SRBM and MRBM threats, and just as important, it begins fielding a netted sensor and weapons infrastructure.

EUROPEAN PAA PHASE II (~2015) ENHANCED MRBM DEFENSE IN EUROPE

Phase II of the European PAA further embodies operational innovation. From a developmental point of view, the introduction of Aegis with SM–3 IB interceptors and AN/TPY–2 radars gives us expanded capability against MRBMs. We also significantly increase the size of area that can be defended. The true operational innovation in this phase comes from the increasing use of integrated and networked systems and the concept of placing SM–3 on land in Romania as a part of Aegis Ashore.

Aegis Ashore is a shift away from forward based GBIs in fixed launch sites, to a relocatable land-based Aegis radar with land-based SM–3 IB interceptors. This approach provides all the engagement range and capability of an Aegis ship but without the requirement to keep a ship in a fixed location for extended periods of time, nor the cost of maintaining the rest of the multi-mission capability of an Aegis warship. Operationally this allows a combatant commander to provide long-term coverage for his assets or allies, establish a presence, and have a visible deterrent in theater. Similarly, a land-based SM–3 system can be augmented with Aegis warships and other BMDS assets to provide a very robust defense if the situation warrants. This is a very operationally responsive concept for the combatant commanders.

A more significant development beyond deployment of a new weapon system is the operational leverage gained from the improvements in the SM–3 Block IB interceptor. The SM–3 IB seeker's discrimination capability improves its performance during intercepts. The SM–3 IB will be deployed with Aegis Ashore and Aegis ships at sea. Because the missile seeker has been improved, both Aegis at sea and on land will be able to launch on remote sensor data (for example, using data from one of the land based radars). The operational impact of this concept is not obvious until you understand that the SM–3 missile has a fly-out range that goes well beyond where the Aegis radar can detect. The establishment of networks combined with the ability to use remote sensor data enables a combatant commander to take full advantage of the SM–3 range and reach out to extremely long ranges to engage targets. Operationally, this equates to a much larger defended area and a greater number of defended assets with the same force structure. The ability to use multiple weapons systems, and particularly systems that are not in the immediate area, does several things. First, it prevents an enemy from being able to tell which assets are being defended. Second, it makes it impossible to determine ahead of time which defensive systems have a shot at an incoming missile. Lastly, it prevents an adversary from being able to take down our defenses by targeting a single node. I would summarize Phase II as the transition phase where we move from classic concepts of single asset employment to a modern networked concept.

EUROPEAN PAA PHASE III (~2018) ENHANCED IRBM DEFENSE IN EUROPE AND PHASE IV (~2020) EARLY INTERCEPT DEFENSE IN EUROPE

European PAA Phases III and IV add significant operational capability and continue to leverage and build on the netted infrastructure of the earlier phases. The key capability in Phase III is the addition of the SM–3 IIA, to be deployed in Poland, which will expand the defended area against MRBMs and Intermediate Range Ballistic Missiles (IRBMs). SM–3 IIA will be fielded with both Aegis ships and land-based SM–3 systems. Phase IV adds SM–3 IIB to our Aegis Ashore sites which will be capable of engaging potential future ICBMs from today's regional ballistic missile

threats. This is the first capability beyond GBIs to defend against ICBMs, and provides enhanced defense of the Homeland. The SM–3 IIB also adds the ability to intercept MRBMs and IRBMs earlier in their flights which allows the warfighter to thin out large raid sizes, and suppress the use of countermeasures by engaging a missile before they are deployed. Phases III and IV will both continue the use of netted employment and its inherent advantages.

At the completion of Phase IV, Commander EUCOM will have multiple defensive capabilities across the entire ballistic missile threat regime from SRBMs to ICBMs. It's worthwhile at this point to contrast the European PAA with the previous approach for defense of Europe to further illustrate the operational impact. Under the previous GBI approach we could defend portions of Europe, but the primary benefit was defense of the U.S. Homeland. Under EPAA we defend increasing areas of Europe, enhance defense of the Homeland, and develop capabilities that can be deployed worldwide. So operationally, PAA does much more than support a specific combatant commander, it provides capabilities that can be employed by every combatant commander. This is major step forward in protection for the United States and its allies and partners.

Before I leave the operational discussion of the EPAA Phases, I wanted to reinforce the point that BMD, such as we embody in the EPAA, is not an isolated mission but part of a larger campaign against an adversary. Fundamentally, the BMDS is not, and cannot be, the sole method by which we defend ourselves against the threat or use of aggressor ballistic missiles. Many potential aggressors already have larger threat missile inventories than we have, or expect to have, numbers of interceptor missiles. BMDs can prevent an adversary from winning the fight with the first wave of the attack, limit damage to friendly forces and civilians, and provide time for our other elements of national and military power to be brought to bear to end the conflict. Further, the possession of a capable BMD such as provided by the EPAA, assists in deterring potential aggressors from the use of ballistic missiles, as they have to contemplate that they will not be successful in achieving their aims from the use of these weapons.

ANALYSIS SUPPORTING PAA DEVELOPMENT

The analytic efforts that JIAMDO leads are used to support operational planning by the warfighters, and support the resources and acquisition communities in research and development, production, budget, and programming decisions on missile defense. We have recently completed the base case of the JCM III to examine the implications and opportunities of the PAA as an element of our overall capability for BMD. The study has been reviewed by the Department; we are in the process of briefing the results to appropriate parties including this committee; and, we are continuing the analytic efforts of JCM III to examine a number of excursions and alternatives that we have developed. The study results cannot be discussed in this open forum, but I will discuss the process used at this point. I am prepared to discuss the classified results in a closed session following our time this afternoon, or at another time at the committee's convenience or that of some of the members.

Building a BMD capability is a blend of determining what the right technology is, how many of each system is acquired, and how are the elements to be applied in different contexts of threat, geography, and international political and military environments of allies and partners. In operational terms this gets shortened to "how much PAA do we need, and where?" A simple phrase, but a very complex problem.

We previously conducted JCM I in 2005–2006 and JCM II in 2007–2008. These focused on the number of interceptors that might be required under different scenarios against specific threats.

There are three main differences between these earlier studies and JCM III:

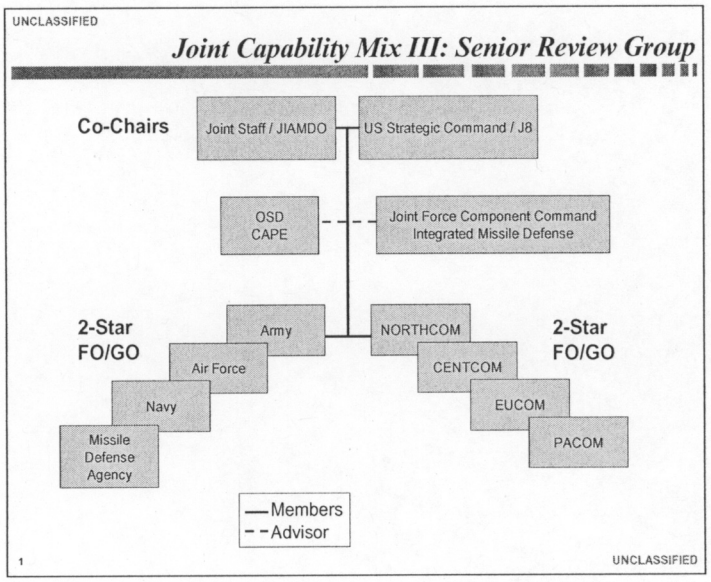
First, JCM III examined all the elements of the regional BMD system, including sensors systems, launcher systems, and interceptors, whereas the previous studies only looked at interceptors.

Second, JCM III examined performance against threat ballistic missiles that employed a range of countermeasures; we had not done this previously.

Third, JCM III has been a study of warfighting sufficiency rather than inventory acquisition objectives. We examined the ability of the application of PAA architectures in different AOR of the combatant commanders to determine how BMDS contributed to their overall plan to deter aggressors and, if necessary to end enemy ballistic missile attacks should they occur. We do not attempt to simply answer how much to buy; we give alternatives to the warfighter to best achieve his overall goals.

I would also like to spend a couple of minutes discussing the study methodology. In order to determine force needs at this level of granularity, we had to take into

account how the COCOMs intend to employ them, what the threats are, and generally how the threat will be expected to be employed. COCOMs provided operational employment information, to include asset laydowns and shot doctrine. For system performance, we went to the experts at MDA. The analysis was executed by JIAMDO in conjunction with representatives from CENTCOM, EUCOM, PACOM, STRATCOM, NORTHCOM, MDA, the Services, and the Office of the Secretary of Defense Cost Assessment and Program Evaluation. The significant level of warfighter and developer involvement in the process is why we have such a high level of confidence in the results. The results have been briefed to the JROC, the Missile Defense Executive Board, and finally to the Deputy Secretary of Defense's Advisory Working Group. I have included a graphic on the Senior Review Group of the study to illustrate the inclusive approach we use for our analysis.



EUROPEAN PHASED ADAPTIVE APPROACH AND NORTH ATLANTIC TREATY ORGANIZATION

As I mentioned earlier, NATO has just taken the decision that BMD is " ... a core element of our collective defence." In both my role as the Director of JIAMDO, and as the U.S. head of delegation to the NADC, I have spent a significant amount of time discussing the EPAA with various allies and friends throughout Europe. The United States is not building a missile defense system in isolation. Our allies are appreciative of our efforts to include them in our discussions and explain our missile defense concepts and approaches. The EPAA concept and implementation provides the opportunity for allies and partners across the globe to participate with and alongside U.S. systems. Not only is this the right thing to do, it is a very effective and efficient approach to missile defense that allows all participants to leverage the investment the other nations are making. The recent MDA demonstration of C2BMC with NATO's Active Layered Theatre Ballistic Missile Defence is a premier example of the right approach to follow.

Now that NATO has made the decision, the U.S. BMDS capabilities of the European PAA will constitute our national contribution to this mission. We will work closely within the Alliance to craft the appropriate command and control structure to provide for the effective defense of ourselves and our partners from ballistic missile threats in the region.

SUMMARY

The Department is investing a significant portion of its budget in missile defense and the PAA is providing the necessary framework to ensure it is invested effec-

tively and wisely. The PAA is shaping the integration and networking of our systems across the COCOMs, Services, and allies which is the correct path to successful and effective missile defense. We have established a solid process and analytic approach to monitor and guide the implementation of the PAA and expect to develop and field the phases in the most operationally effective and cost efficient manner possible.

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

Senator NELSON. Thank you, Admiral.

Ms. Chaplain.

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

Ms. CHAPLAIN. Chairman Nelson, Ranking Member Sessions, and members of the subcommittee: Thank you for inviting me to discuss accountability and transparency for the BMDS. As you noted earlier, the BMDS is DOD's largest single acquisition program. It is also likely the most challenging, not only because of the inherent technical challenges involved with the missile defense mission, but because of the wide range of assets involved, the global nature of the system, and the need for a high degree of integration and jointness.

While the inherent risks are substantial, intense early schedule pressures driven by presidential directive exacerbated acquisition risks, as they required MDA to take on a high degree of concurrency in development. That concurrency continues. More recently, budgetary pressures have further challenged MDA. A faster pace of acquisition and development activity often comes with a higher price tag. Yet, fiscal conditions require DOD to reexamine all of its programs with an eye toward achieving greater cost efficiencies and savings.

Taken together, these conditions create a high risk environment for the MDA and thus call attention to the need for strong oversight, accountability, and transparency. Yet, the flexibilities given to MDA in order to field initial capability quickly have made accountability and transparency elusive. Our testimony and report detail the differences between the BMDS and DOD's largest acquisition programs. I would just like to highlight a few.

First, while other large programs have been required to create baselines and report variances once they enter into the engineering and manufacturing development cycle, until recently MDA has not been required to do so for pieces of the missile defense system.

Second, while other programs must obtain approval of a higher level acquisition executive before making changes to their baselines, MDA does not. In fact, the Director of MDA serves as both approving acquisition executive and as the program manager.

Third, while other programs must obtain independent life cycle cost estimates, MDA does not.

Fourth, while other programs must complete initial operational test and evaluation before proceeding beyond low rate initial production, MDA does not.

This broad flexibility enabled MDA to make decisions faster than other acquisition programs and to be more agile. But from an oversight and decisionmaking perspective, there were considerable dis-

advantages. The lack of baselines for BMDS along with high levels of uncertainty about requirements and program cost estimates effectively set the missile defense program on a path to an undefined destination at an unknown cost.

I'm pleased to report, however, that the MDA has recently made significant strides in increasing transparency and accountability. Specifically, in the last year MDA established resource, schedule, test, operational capacity, technical, and contract baselines for several BMDS components. MDA also identified three phases where baselines are approved to help ensure the appropriate level of knowledge is obtained before acquisitions move from one phase to the next.

In addition, MDA implemented a process under which product development and initial production baselines can be jointly reviewed by MDA and the military Service senior leaders, as a number of missile defense systems are expected to eventually transition to the Services for operation. These improvements were made subsequent to recent improvements to test planning to better link testing to models and simulations needed to assess performance and to extend test planning into the future.

Given the breadth, scope, and complexity of the systems involved in the missile defense mission and the wide range of stakeholders and gaps in past data, these improvements were not easy achievements. Significant progress has been made. Nevertheless, there is still much work ahead to ensure oversight and management data is clear, complete, accurate, and reliable. My statement and our report detail improvements that are needed, particularly in the areas of cost reporting and testing.

Moreover, improvements to oversight reporting should be complemented by other actions, including stabilizing the approach to acquisition efforts, improving transparency and accountability for the EPAA, and lastly embracing knowledge-based acquisition practices that ensure programs complete developmental activities before proceeding in production, that test plans are stabilized and adequately reported, and that targets used for testing are reliable, available, and affordable.

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

[The prepared statement of Ms. Chaplain follows:]

PREPARED STATEMENT BY CRISTINA CHAPLAIN

Chairman Nelson, Ranking Member Sessions, and members of the subcommittee: I am pleased to be here today to discuss the transparency and accountability progress made by the Department of Defense's (DOD) Missile Defense Agency (MDA). MDA has been charged with developing and fielding the Ballistic Missile Defense System (BMDS), a system expected to be capable of defending the United States, deployed troops, friends, and allies against ballistic missiles of all ranges in all phases of flight. The BMDS is DOD's single largest acquisition program—spending between approximately $7 billion to $9.5 billion per year—to develop and field nine elements and supporting efforts. The system's architecture includes space-based and airborne sensors as well as ground- and sea-based radars; ground- and sea-based interceptor missiles; and a command and control, battle management, and communications system to provide the warfighter with the necessary communication links to the sensors and interceptor missiles.

In fulfilling this charge, MDA began delivering an initial defensive capability in 2004. In meeting this challenge, MDA was afforded much more flexibility than DOD's other major weapons programs. However, this flexibility also introduced

transparency and accountability challenges that persisted after the 2004 date for initial capability. Today, I will highlight significant progress that MDA has recently made to strengthen accountability and transparency and also the shortfalls that still need to be addressed in order to further strengthen MDA's oversight posture and ensure new capabilities are fiscally sustainable for the long term.

Since 2002, the National Defense Authorization Acts have mandated that we prepare annual assessments of MDA's ongoing cost, schedule, testing, and performance progress.[1] In March 2011, we issued our report covering MDA's progress toward achieving its goals during fiscal year 2010 as well as its efforts to improve transparency, accountability, and oversight.[2] My statement today will focus on the issues covered in that report. We conducted this performance audit from March 2010 to March 2011 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our fmdings and conclusions based on our audit objectives. Additional information on our scope and methodology is available in the issued report.

ACQUISITION FLEXIBILITY GIVEN TO MDA HAS DOWNSIDES FOR OVERSIGHT AND ACCOUNTABILITY

MDA is a unique agency with extraordinary acquisition flexibility and a challenging mission, however while that flexibility has helped it to rapidly field systems, it has also hampered oversight and accountability.

Over the years, Congress has created a framework of laws that makes major defense acquisition programs accountable for their planned outcomes and cost, gives decisionmakers a means to conduct oversight, and ensures some level of independent program review. Application of many of these laws is triggered by the phases of the Department of Defense's acquisition cycle, such as entry into engineering and manufacturing development. Specifically, major defense acquisition programs are generally required by law and policy to do the following:

- Document program parameters in an acquisition program baseline that, as implemented by DOD, has been approved by the Milestone Decision Authority, a higher-level DOD official prior to the program's entry into the engineering and manufacturing development phase.[3] The baseline provides decisionmakers with the program's best estimate of the program's total cost for an increment of work, average unit costs for assets to be delivered, the date that an operational capability will be fielded, and the weapon's intended performance parameters.
- Once approved, measure the program against the baseline, which is the program's initial business case, or obtain the approval of a higher-level acquisition executive before making changes.
- Obtain an independent life-cycle cost estimate prior to beginning engineering and manufacturing development, and/or production and deployment.[4] Independent life-cycle cost estimates provide confidence that a program is executable within estimated cost.
- Regularly provide detailed program status information to Congress, including information on cost, in Selected Acquisition Reports.[5]
- Report certain increases in unit cost measured from the original or current program baseline.[6]
- Covered major defense acquisition programs and subprograms are required to complete initial operation test and evaluation before proceeding

[1] National Defense Authorization Act for Fiscal Year 2002, Pub. L. No. 107–107, § 232(g) (2001); Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005, Pub. L. No. 108–375, § 233 (2004); National Defense Authorization Act for Fiscal Year 2006, Pub. L. No. 109–163, § 232; John Warner National Defense Authorization Act for Fiscal Year 2007, Pub. L. No. 109–364, § 224 (2006); and National Defense Authorization Act for Fiscal Year 2008, Pub. L. No. 110–181, § 225.

[2] GAO, Missile Defense: Actions Needed to Improve Transparency and Accountability, GA0–11–372 (Washington, DC: March 24, 2011).

[3] 10 U.S.C. § 2435 requires an approved program baseline description for major defense acquisition programs before the program enters system development and demonstration, production and deployment, and full rate production. The system development phase of the DOD acquisition cycle is now known as the engineering and manufacturing development phase.

[4] 10 U.S.C. § 2434.

[5] 10 U.S.C. § 2432.

[6] 10 U.S.C. § 2433, also known as "Nunn-McCurdy".

beyond low-rate initial production.[7] After testing is completed, the Director for Operational Test and Evaluation assesses whether the results of the test confirm that the system or components are effective and suitable for combat.

When MDA was established in 2002, it was granted exceptional flexibility in setting requirements and managing the acquisition, in order that its BMDS be developed as a single program, using a capabilities-based, spiral upgrade approach to quickly deliver a set of integrated defensive capabilities. This decision deferred application of DOD acquisition policy to BMDS until a mature capability is ready to be handed over to a military service for production and operation. Because the BMDS program has not formally entered the DOD acquisition cycle, application of laws that are designed to facilitate oversight and accountability of DOD acquisition programs and that are triggered by phases of this cycle, such as the engineering and manufacturing development phase, has also effectively been deferred. This gives MDA unique latitude to manage the BMDS and it enabled MDA to begin delivering an initial defensive capability in 2004. However, the flexibility also came at the expense of transparency and accountability.

Specifically, a BMDS cost, schedule, and performance baseline does not have to be established or approved by anyone outside MDA. Recent laws have created some baseline-related requirements for parts of the BMDS.[8] In addition, while most major defense acquisition programs are required by statute to obtain an independent verification of cost estimates, MDA has only recently developed cost estimates for selected assets and plans to work with the DOD Office of the Director for Cost Assessment and Program Evaluation to develop independent cost estimates for more MDA elements. Further, assessments of a system's suitability and effectiveness in combat have only been accomplished, with limitations, for the currently deployed Aegis BMD weapon system. The limited amount of testing completed, which has been primarily developmental in nature, and the lack of verified, validated, and accredited models and simulations prevent the Director of Operational Test and Evaluation from fully assessing the effectiveness, suitability, and survivability of the BMDS in annual assessments. MDA has agreed to conduct an operational flight test in 2012.

As we concluded in a prior report, having less transparency and accountability than is normally present in a major weapon program has had consequences.[9] The lack of baselines for the BMDS along with high levels of uncertainty about requirements and program cost estimates effectively set the missile defense program on a path to an undefined destination at an unknown cost. Across the agency, these practices left programs with limited knowledge and few opportunities for crucial management oversight and decisionmaking concerning the agency's investment and the warfighter's continuing needs. At the program level, these practices contributed to quality problems affecting targets acquisitions, which in turn, hampered MDA's ability to conduct tests as planned.

NUMEROUS STRATEGY CHANGES HAVE EXACERBATED TRANSPARENCY AND ACCOUNTABILITY CHALLENGES

MDA has employed at least three strategies to acquire and deploy missile defense systems, which has exacerbated transparency and accountability challenges. From its inception in 2002 through 2007, MDA developed missile defense capability in 2-year increments, known as blocks, each built on preceding blocks intended to enhance the development and capability of the BMDS. However, there was little visibility into baseline costs and schedules associated with the systems that comprised the blocks or how the blocks addressed particular threats.

In response to our recommendations, in December 2007, MDA announced a new capabilities-based block structure intended to improve the program's transparency, accountability, and oversight. Instead of being based on 2-year time periods, the new

[7] 10 U.S.C § 2399 requires completion of initial operational test and evaluation of a weapon system before a program can proceed beyond low-rate initial production. According to DOD policy, low-rate initial production is intended to result in completion of manufacturing development in order to ensure adequate and efficient manufacturing capability and to produce the minimum quantity necessary to provide production or 1production-representative articles for initial operational test and evaluation, establish an initial production base for the system; and permit an orderly increase in the production rate for the system, sufficient to lead to full-rate production upon successful completion of operational (and live-fire, where applicable) testing.

[8] National Defense Authorization Act for Fiscal Year 2008, Pub. L. No. 110–181, § 223(g); Ike Skelton National Defense Authorization Act for Fiscal Year 2011, Pub. L. No. 111–383, § 225.

[9] GAO, Defense Acquisitions: Missile Defense Transition Provides Opportunity to Strengthen Acquisition Approach, GA0–10–311 (Washington, DC. Feb. 25, 2010).

blocks focused on fielding capabilities that addressed particular threats. Because the new block structure was not aligned to regular time periods, multiple blocks were under way concurrently. This approach included several positive changes, including a DOD commitment to establish total acquisition costs and unit costs for selected block assets, including only those elements or components of elements in a block that would be fielded during the block and abandoning deferrals of work from one block to another.

MDA was still transitioning to this new capabilities-based block approach when the Director, MDA terminated it in June 2009. According to MDA, this was done in order to address congressional concerns regarding how to structure MDA's budget justification materials. This termination marked the third acquisition management strategy for the BMDS in the prior 3 years and effectively reduceo transparency and accountability for the agency. The agency then began to manage BMDS as a single integrated program but planned to report on cost, schedule, and performance issues by each element within the program.

Changing the acquisition strategy is problematic because each time it is changed, the connection is obscured between the old strategies' scope and resources and the new strategy's rearranged scope and resources. This makes it difficult for decision-makers to hold MDA accountable for expected outcomes and clouds transparency of the agency's efforts.

We also reported in December 2010 that the adoption of the European Phase Adaptive Approach (PAA) for deploying missile defense assets has limitations in transparency and accountability.[10] Specifically, we reported that DOD made progress in acquisition planning for technology development and systems engineering and testing and partial progress in defming requirements and identifying stakeholders but had not yet developed a European PAA acquisition decision schedule or an overall European PAA investment cost. We found that the limited visibility into the costs and schedule for the European PAA and the lack of some key acquisition management processes reflect the oversight challenges with the acquisition of missile defense capabilities that we have previously reported. We concluded that for the European PAA, the flexibility desired by DOD is not incompatible with appropriate visibility into key aspects of acquisition management. Moreover, as DOD proceeds with the European PAA acquisition activities, it is important for Congress and the President to have assurance that the European PAA policy is working as intended and that acquisition activities are cost-effective. We made recommendations also in January 2011 regarding the development of life-cycle cost estimates and an integrated schedule for the acquisition, infrastructure, and personnel activities to help identify European PAA implementation risks.[11] DOD partially concurred with the first recommendation and fully concurred with the second.

PRIOR GAO RECOMMENDATIONS AND CONGRESSIONAL ACTIONS TO IMPROVE TRANSPARENCY AND ACCOUNTABILITY

Congress has taken action to address concerns regarding the acquisition management strategy, accountability, and oversight of MDA. For example, in the National Defense Authorization Act for Fiscal Year 2008, Congress required MDA to establish acquisition cost, schedule, and performance baselines for each system element that has entered the equivalent of the engineering and manufacturing development phase of acquisition or is being produced or acquired for operational fielding.[12] Most recently, the Ike Skelton National Defense Authorization Act for Fiscal Year 2011 requires the Secretary of Defense to ensure that MDA establishes and maintains an acquisition baseline for each program element of the BMDS.[13]

Since our first MDA report in 2004, we have made a series of recommendations to improve transparency and accountability, many of which are designed to adapt the key transparency and accountability features already embedded in the DOD acquisition regulation and apply them to MDA. Some of our key recommendations include:

- Establishing and reporting to Congress costs and unit costs, including development costs in unit costs, including sunk costs in cost estimates, reporting top-level test goals, obtaining independent cost estimates and taking

[10] GAO, Missile Defense: European Phased Adaptive Approach Acquisitions Face Synchronization, Transparency, and Accountability Challenges, GAO–11–179R (Washington, DC: Dec. 21, 2010).

[11] GAO, Ballistic Missile Defense: DOD Needs to Address Planning and Implementation Challenges for Future Capabilities in Europe, GA0–11–220 (Washington, DC: Jan. 26, 2011).

[12] Pub. L. No. 110–181, § 223(g).

[13] Pub. L. No. 111–383, § 225.

steps to ensure the underlying cost estimates are high quality, reliable, and documented reporting variances.

• Improving transparency by requesting and using procurement funds instead of research, development, testing and evaluation funds to acquire fielded assets.

• Strengthening the test program by establishing baselines for each new class of target in development, including sufficient schedule and resource margin, including spare test assets and targets, and strengthening the role of the Director, Operational Test and Evaluation in assessing missile defense progress.

• Implementing a knowledge-based acquisition strategy[14] consistent with DOD acquisition regulations, and ensure that items are not manufactured for fielding before their performance has been validated through testing.

MDA HAS RECENTLY MADE SIGNIFICANT PROGRESS IN INCREASING TRANSPARENCY AND ACCOUNTABILITY

DOD has committed to take action on many of these recommendations. While agreeing with our recommendations to enhance baseline reporting, there are differences in MDA's perspectives on such issues as sunk costs and changes in unit cost.

In 2010, MDA made significant progress in implementing some of these recommendations by fmalizing a new baseline phase review process in which the agency set detailed baselines for several BMDS elements, or portions of elements, for the first time. Specifically, MDA established resource, schedule, test, operational capacity, technical, and contract baselines for several BMDS components. It reported these to Congress in its June 2010 BMDS Accountability Report.

MDA also identified three phases of development where baselines are approved-technology development, product development, and initial production phases-and specified the key knowledge that is needed at each phase. MDA officials stated that they expect that aligning the development efforts with the phases will help to ensure that the appropriate level of knowledge is obtained before the acquisitions move from one phase to the next.

In another key step, approval of the product development and initial production baselines will be jointly reviewed by the Director of MDA and the respective service acquisition executive, as a number of missile defense systems are expected to eventually transition to the military services for operation. In addition, in regard to these new phases, the agency established a process for approving baselines. As a result of MDA's new baseline phase review process, its 2010 BMDS Accountability Report is more comprehensive than its 2009 report.

MDA also undertook a new approach to testing in recent years to address our prior findings. In March 2009, we reported that MDA's Integrated Master Test Plan—its test baseline—was not effective for management and oversight because it was revised frequently, only extended through the following fiscal year and was not well integrated with other key aspects of testing such as target acquisitions.[15] In addition, the BMDS Operational Test Agency identified several limitations in the previous BMDS test program, including unaccredited models and simulations, flight test artificialities, and inadequate modeling of some environmental conditions.. Congress also expressed concern with MDA's test approach. For example, in the National Defense Authorization Act for Fiscal Year 2008 conference report, conferees noted that MDA failed to ensure an adequate testing program and that its test and targets program needed to be managed in a way that fully supported high-priority near-term programs.

We reported last year that MDA extensively revised the test plan to address these concerns.[16] MDA's new approach now bases test scenarios on modeling and simulation needs and extends the test baseline to cover the Future Years Defense Program which allows for better estimation of target needs, range requirements, and test assets. Also, as part of its new test plan, MDA scheduled dedicated periods of developmental and operational testing, during which the system configuration will remain fixed to allow the warfighter to carry out training, tactics, techniques, and procedures for developmental and operational evaluation. Additionally, the new test plan is expected to provide sufficient time after test events to conduct a full post-test

[14] A knowledge-based acquisition approach is a cumulative process in which certain knowledge is acquired by key decision points before proceeding.

[15] GAO, Defense Acquisitions: Production and Fielding of Missile Defense Components Continue with Less Testing and Validation Than Planned, GA0–09–338 (Washington, DC: March 13, 2009).

[16] GA0–10–311.

analysis. As we reported last year, these improvements are important because BMDS performance cannot be fully assessed until models and simulations are accredited and validated and the test program cannot be executed without meeting its target needs.

These steps represent significant progress in providing a better foundation for managing and overseeing the missile defense system. Given the breadth, scope, and complexities of systems involved in the missile defense mission and the wide range of stakeholders and gaps in past data, these were not easy achievements. Nevertheless, there is a significant amount of work ahead to ensure oversight and management data is clear, complete, accurate, and reliable. Specifically:

- We found that the cost baselines that have been established are not clear, consistent and complete nor are they based on high quality estimates and therefore we remain unable to assess cost progress for the 8th year until MDA develops high-quality, reliable cost estimates. For example, we found that the unit cost baselines and the baselines for portions of and sometimes all the life cycle costs reported to Congress did not provide clear, consistent, and complete information. We also assessed the 12 life cycle cost estimates that were the basis for these baselines and found that half did not support the baselines and the other half were insufficient to be considered high-quality, reliable cost estimates.
- Our assessment of the schedule baselines determined that we could not compare the asset delivery schedule to the prior year's baseline because MDA has stopped reporting a comprehensive list of planned asset deliveries.
- Finally, we found the test baseline to be well documented. However, because it is success oriented, any problems encountered in executing the plan can cause ripple effects throughout remaining test events. The frequent changes that continue to occur undermine the value of the test baseline as an oversight tool.

RAPID PACE OF FIELDING ASSETS MAKES TRANSPARENCY AND ACCOUNTABILITY EVEN MORE IMPORTANT

Over the past 10 years, we have conducted extensive research on successful programs and have found that successful defense programs ensure that their acquisitions begin with realistic plans and baselines prior to the start of development. We have previously reported that the key cause of poor weapon system outcomes, at the program level, is the consistent lack of disciplined analysis that would provide an understanding of what it would take to field a weapon system before system development begins. We have reported that there is a clear set of prerequisites that must be met by each program's acquisition strategy to realize successful outcomes. These prerequisites include establishing a clear, knowledge-based, executable business case for the product. An executable business case is one that provides demonstrated evidence that: (1) the identified needs are real and necessary and can best be met with the chosen concept; and (2) the chosen concept can be developed and produced within existing resources—including technologies, funding, time, and management capacity. Knowledge-based acquisition principles and business cases combined are necessary to establish realistic cost, schedule and performance baselines. Without documented realistic baselines there is no foundation to accurately measure program progress. Our work has shown that when agencies do not follow a knowledge-based approach to acquisition, high levels of uncertainty about requirements, technologies, and design often exist at the start of development programs. As a result, cost estimates and related funding needs are often understated.

MDA has begun to institute some key aspects of a knowledge-based approach to acquisition as we noted. Moreover, in its Ballistic Missile Defense Review, DOD emphasized that it is no longer necessary to pursue a high-risk acquisition strategy that simultaneously develops and deploys new systems. However, we continue to identify and report on areas of high levels of acquisition risk associated with the rapid pace of fielding assets. We see this effect most pronounced in three key areas—testing, the Aegis Ashore program and the Ground-based Midcourse Defense (GMD) program.

- Testing and Targets: As in previous years, failures and delays in testing have continued to delay the validation of models and simulations used to assess BMDS performance. Target availability was a significant, though not the only, driver to the test plan delays. Since 2006, we have reported that target availability has delayed and prompted modifications to planned test objectives. This trend continued in 2010. We reported this year that five tests scheduled for fiscal year 2010 were canceled because of a moratorium

on air launches of targets. The moratorium was imposed following the failure of an air launched target participating in MDA's December 2009 Theater High Altitude Area Defense (THAAD) flight test. A failure review board investigation identified the rigging of cables to the missile in the aircraft as the immediate cause of the failure and shortcomings in internal processes at the contractor as the underlying cause. Additionally, target shortfalls contributed to delays in flight tests, reduced the number of flight tests, and altered flight test objectives.

Another area of risk related to targets identified in this year's report is MDA's extended use of an undefmitized contract action to acquire targets from its incumbent prime targets contractor.[17] This action, signed in April 2010, asked the prime contractor to build a new type of medium-range air-launched target. The contract action initially included three targets; the quantity was then increased to five targets in September 2010. The current "not-to-exceed" level for the contract action is $496 million. MDA has allowed this undefinitized contract action to continue for an extended period. According to MDA officials, the delay in defmitization is due to changes in its requirements for the targets, and they anticipate definitization in July 2011, by which time the contract action will have remained undefinitized for about 450 days. MDA officials stated that this new acquisition was to obtain a second procurement source for air-launched targets following the December 2009 THAAD flight test failure. The extended use of undefinitized contract actions has previously been identified by GAO and others as risky to the government. Because contracting officers normally reimburse contractors for all allowable costs they incur before definitization, contractors bear less risk and have little incentive to control costs during this period. The government also risks incurring unnecessary costs as requirements may change before the contract is definitized.

• Aegis Ashore: Aegis Ashore is MDA's future land-based variant of the ship-based Aegis BMD. It is expected to track and intercept ballistic missiles in their midcourse phase of flight using Standard Missile-3 (SM–3) interceptor variants as they become available. However, while Aegis BMD has demonstrated performance at sea, these demonstrations used the currently fielded 3.6.1 version of Aegis BMD with the SM–3 IA interceptor, not the newer variant of the Aegis operating system and new interceptor that Aegis Ashore will use. Aegis Ashore is dependent on next-generation versions of Aegis systems—Aegis 4.0.1 and Aegis 5.0—as well as the new SM–3 IB interceptor, all of which are currently under development. Moreover, a series of changes are required to further modify these new variants of Aegis BMD for use on land with Aegis Ashore. These modifications include changes to the Vertical Launching System; suppression or disabling of certain features used at sea; design, integration, and fabrication of a new deckhouse enclosure for the radar, and potential changes to the SM–3 IB interceptor. Changes to those existing Aegis BMD components that will be reused for Aegis Ashore may reduce their maturity in the context of the new Aegis Ashore program, and new features will require testing and assessment to demonstrate their performance. MDA plans to make production decisions for the first operational Aegis Ashore before conducting both ground and flight tests. We concluded in this year's report that it is a highly concurrent effort, with significant cost, schedule, and performance risk.

• Ground-based Midcourse Defense: GMD is a ground-based defense system designed to provide combatant commanders the capability to defend the homeland against a limited attack from intermediate, and intercontinental-range ballistic missiles during the midcourse phase of flight. The GMD consists of a ground-based interceptor—a booster with an Exoatmospheric Kill Vehicle on top—and a fire control system that receives target information from sensors in order to formulate a battle plan. GMD continues to deliver assets before testing has fully determined their capabilities and limitations. The Director, MDA testified on March 31, 2011 that he considers the GMD interceptors essentially prototypes. In the urgency to deploy assets to meet the Presidential directive to field an initial capability by 2004, assets were built and deployed before developmental testing was completed. During the

[17] To meet urgent needs, DOD can issue undefinitized contract actions, which authorize contractors to begin work before reaching a final agreement on contract terms. Undefinitized contract action means any contract action for which the contract terms, specifications, or price are not agreed upon before performance is begun under the action. Department of Defense Federal Acquisition Regulation Supplement 217.7401(d).

ongoing developmental testing, issues were found that led to a need for retrofits. GMD intercept tests conducted to date have already led to major hardware or software changes to the interceptors—not all of which have been verified through flight testing. In addition, manufacturing of a new variant called the Capability Enhancement II is well underway and more than half of those variants have already been delivered although their capability has not been validated through developmental flight tests. To date, the two flight tests utilizing this variant have both failed to intercept the target. According to MDA, as a result of the most recent failure in December 2010, deliveries of this variant have been halted. Again, because of the urgency to deploy some capability, limited work was undertaken on long-term sustainment for the system which is critical to ensure the system remains effective through 2032. In September 2010, MDA finalized the GMD Stockpile Reliability Program Plan, a key step in developing the knowledge needed to determine the sustainment needs of the GMD system.

CONCLUDING OBSERVATIONS

This year MDA has made significant strides in providing a better foundation for Congress and others to assess progress and hold senior leadership accountable for outcomes. Undoubtable progress has been made in terms of implementing new acquisition reviews and reporting detailed baselines, but critical gaps remain in the material reported, particularly the quality of the underlying cost estimates needed to establish baselines. We look forward to continuing to work with DOD and MDA in addressing these gaps and further strengthening the underpinnings for sound oversight. Moreover, as we have recommended previously, improvements to oversight reporting should be complemented by knowledge-based acquisition approaches that ensure programs complete developmental activities before proceeding into production; that test plans are stabilized and adequately resourced; and that targets used for testing are reliable, available, and affordable. Given the breadth and scope of the European Phased Adaptive Approach it is also important that Congress have assurance that this policy is working as intended and is cost-effective.

Chairman Nelson, Ranking Member Sessions, and members of the subcommittee, this completes my prepared statement. I would be happy to respond to any questions you may have at this time.

Senator NELSON. Thank you.

I guess now I get to ask a question. General O'Reilly, as I was starting to say, and I think you began to address it, being more than halfway through fiscal year 2011 and DOD still operating under a continuing resolution at fiscal year 2010 funding levels, can you tell us what the impacts on your missile defense program has been on operating under the continuing resolution (CR), and will you be able to mitigate some of those impacts if Congress passes a year-long funding resolution with most of the fiscal year 2011 defense appropriation levels soon?

General O'REILLY. Thank you, sir. The impact of the CR, series of CRs, for 2011 on the MDA's program has been significant. One area, for example, is the GMD system, which the President had requested a $324 million increase in fiscal year 2011 over fiscal year 2010, so we're still operating at the fiscal year 2010 position. That is significant when it comes to construction, for example, of the GMD system in Alaska. We're approaching the construction season, where most of the work is done, and if we were not able to get a budget this week I would be in a significantly diminished position in order to hire the construction crews on time and we could perhaps lose most of the year's construction.

The mitigation to that is, if it does look like and if we do receive a budget for fiscal year 2011 I will be able to accomplish about 80 percent of the construction I was intending. But I must tell you that across our programs the CRs have prevented us from starting new starts for fiscal year 2011, such as our satellite programs that

were to support EPAA, and they have caused a tremendous inefficiency in allowing contracts to only move forward, very large contracts, for several weeks at a time.

So the combined impact is a significant inefficiency and a reduction in, now with this budget, how much I can accomplish over the remaining months of this fiscal year. I do believe I'm going to have to readjust what I intended to accomplish in fiscal year 2012 because the budget was received in April and before all of the funding will be received will be many weeks later than that.

Senator NELSON. Thank you.

I see we're joined by the chairman of the Senate Armed Services Committee, Senator Levin. Senator Levin, would you have any comments you'd like to make?

Chairman LEVIN. I would have questions later on, but Senator Shaheen was here first, so please go in the regular order. Thank you, though.

Senator NELSON. Thank you.

Senator Shaheen.

Senator SHAHEEN. Thank you, Mr. Chairman.

You all have alluded to the current budget situation that we're facing and clearly it's going to affect everyone across the board. As you look at the budget situation, can you talk about how you expect to be able to keep programs on track? Specifically—I guess this goes to you, General O'Reilly, and perhaps Dr. Roberts—can you talk about the balance between development and testing versus deployment and what potential risks there are if you misjudge on one side or the other?

General O'REILLY. Senator, I will start first. As far as the budget impacts are, as I said, they're very significant across the board. In some cases where we've just lost at least half a year's worth of program and we will not—for example, the start of my satellite surveillance program, our new program—we will now be allowed our new start at the end of this week if we receive a budget, which is more than half a year. I don't believe we're going to be able to catch up on that time.

So in some cases we can't. In other cases, with production lines and so forth, we will try to acquire larger lots of supplies and accelerate the production line on some of our interceptors. But again, I don't believe we're going to be able to mitigate the total impact of the CRs this year. So what we set out to accomplish in 2011, some of it's going to have to occur in 2012.

As far as the balance between testing and development, we have taken a look several years ago at all of the data that was required for testing in order to do two things: one, to confirm for the operational test agencies, independently confirm, that missile defense systems are suitable and operationally deployable and effective. The second reason is to support the accreditation of our models and simulations. Our testing is so expensive—a typical GMD test can cost $300 million. So to fully test its full operational capability, especially against large raid sizes of missiles, it's critical that we have independent verification of our models and simulations which our combatant commanders will use.

So we have set out and restructured our programs to ensure that every new deliverable product has gone through a testing regime

sufficient for the operational test agencies to make an independent assessment, are they ready.

The penalties we can see in the approach for GMD, for example: I can understand why we fielded GMD as quickly as we did, but we will still be testing some of the original fundamental operations of the system for many years. As we discover that we need to upgrade the system because of something we found in flight testing, we will go back and refurbish the missiles we have. So that's why we've started a stockpiling of missiles to do that. But that is much more expensive than to completely qualify, what we call, for production all of our systems on the ground before we go into flight testing.

But I understand why we did it in GMD. We have a strategy to increase over time the reliability of the system through testing. But we will not approach that, nor have we, as a result of the BMDR for the rest of our systems.

Senator SHAHEEN. So when you do those independent verifications of your models, since we're not actually testing in real time, do you have any evidence that there's ever a problem?

General O'REILLY. Senator, there are two levels where we find problems, actually three. The first is in the component testing on the ground. To the greatest extent possible, we replicate the performance of the missile components on the ground as if they were flying. We do that hundreds of times. It occurs in very severe environments. That's our first confidence level that these components work right.

In our latest GMD test, we did find we had a failure mode that could not be replicated on the Earth and that's why I am going to request an additional test to verify we fixed it. The Earth's gravitation is one problem with testing it on the ground, and literally the rotation of the Earth. These are very sensitive items and you must be in flight testing, and the frequencies and shocks that we can replicate on the ground are limited, even with our best capabilities, our best facilities.

So one of the problems is until you're into flight testing you can't totally replicate on the ground. But you can do a lot.

Second is to integrate the system in extensive ground testing. We do it in laboratories and then we repeat it actually in the field with the soldiers, sailors, and airmen operating the system, and we simulate threats on the system and we run those hundreds of times in order to gain a confidence level. But the Director of Operational Test and Evaluation—and each Service has its own independent operational test agency—makes the final assessment on my products, not the MDA, so that there's some independence.

Senator SHAHEEN. Thank you.

In competing for some of the scientists and engineers that we're going to need for the future to continue the work of the MDA and also for DOD, are you comfortable that the current budget actually supports our ability to recruit and train the scientists and engineers and mathematicians that we're going to need? I have an ulterior motive in asking this question because I think we're not doing enough to train the folks in the science, technology, engineering, and mathematics subjects that we're going to need for the future

to continue to lead this country, and obviously in your agency there's a critical need for people with those degrees and training.

General O'REILLY. Ma'am, I couldn't agree more. Senator, our issue with qualified young engineers and scientists has been increased or exacerbated by the 2005 Base Realignment and Closure Act. We moved our technical workforce from Washington, where I had over 3,000 engineers. I will now have 300 people here by the end of September. We moved those to Huntsville, AL, and Colorado Springs and Dahlgren, VA.

The problem was the average age of my workforce was 49, so most of them were not willing to move. So I needed to hire over 1,000 engineers. We went to the universities and there were two aspects that we observed. One, I think it takes personal engagement. I have personally engaged with universities, as well with the chairman, out on trips. We've gotten a tremendous response from that.

Two is, unfortunately, the economy. For every engineering position I have had as we hire the college graduates, we have had between 18 to 26 highly qualified applicants for every position. So the MDA as a consequence, unintended, of the economy, we've received tremendously qualified applicants. The average person we receive has over a 3.8 average. 40 percent are master's degrees or Ph.Ds.

But I do spend a lot of time in the universities, also with research. Key to this is investing in research with the faculty members so they in fact can talk to the students and the postdocs and they can see opportunities in government such as this.

Finally, I have outreach to historically black colleges and universities because our agency had 12 percent minorities, but in the engineering field 2 years ago, .3 percent of our engineers were minorities. Today it's 4 percent. So it may not seem like a lot, but it took a significant amount of effort to reach that.

So in all of those areas, Senator, I couldn't agree more. The young folks really respond to personal energy and personal appearances and that's what I have been pursuing.

Senator SHAHEEN. I'm out of time, but how many women?

General O'REILLY. In some universities over 70 percent of the engineering students are women, and that's reflected today. In the group that we have hired since I first mentioned, over 40, I believe it's 42 or 44 percent are women engineers. So we previously had less than 10 percent—significant growth in that area, too.

Senator SHAHEEN. So what's the final number? Where are you at today?

General O'REILLY. We have hired 380 new college graduates in the last 2 years. What I'm trying to do is prevent a demographic bump again in my organization. So we hire 100 at the end of every semester, to smooth out the demographics.

Senator SHAHEEN. Thank you.

Thank you, Mr. Chairman, for letting me go over.

Senator NELSON. Thank you, Senator.

Senator Sessions.

Senator SESSIONS. Thank you.

General O'Reilly, as I mentioned in the opening statement, after two recent test failures it's clear that GMD is in need of some additional resources. More I think is needed to ensure the capability

that we have works to the advanced degree that you'd like it to operate at.

I would first note—see if I'm correct—that the initial guidance system's kill vehicles have performed ably and I believe 20 of those are in the ground today and you believe are capable of defeating the kind of incoming missiles likely to be received from an Iran or North Korea; is that correct at this point in time?

General O'REILLY. I can't get into the actual number of that configuration, but our original configuration, yes, sir, we have had five flight tests and three intercepts out of three attempts and have found no indication of the type of problem we found in the newest version, where we have failed twice.

Senator SESSIONS. The new version was designed to be even more sophisticated to deal with more sophisticated threats; is that correct?

General O'REILLY. Yes, sir. It had more accurate guidance instrumentation on board.

Senator SESSIONS. So it's going to take some effort to get that under control. I think you've indicated you need more interceptors to facilitate the kind of realistic testing that you believe is necessary. Is that correct?

General O'REILLY. Yes, sir. Before the first generation of GBI, we flew a test where we did not have an intercept, and I'm asking for another test in order to verify that we've resolved the problems on this latest interceptor version.

Senator SESSIONS. Could you give an estimate of what that test might cost, say one test?

General O'REILLY. Sir, since it does not involve a target, the cost would be primarily of the interceptor, which would be around $70 million, and then an additional $30 to $40 million of support for that test. So it's approximately $100 million for that test.

I have also, sir, determined that we're going to need significant ground testing of at least $50 to $100 million more on the ground, again to verify that we have absolutely resolved this problem.

Senator SESSIONS. We've had such a long and basically successful effort to establish the capability to defend the United States against a missile attack, we don't need to stop, allow our adversaries to develop more sophisticated missiles, and then all of our efforts have been not productive.

So you would say that it does make sense that we continue to develop the more sophisticated capabilities that the threats may pose to us in the years to come?

General O'REILLY. Yes, sir. I would agree with, for example as Admiral Winnefeld said, to stay ahead of the threat.

Senator SESSIONS. Dr. Roberts indicated that the threat is qualitatively and quantitatively advancing, I believe.

Now, with regard to this money that's going to be needed, maybe $250 million you just referred to, where do you plan to get that and how can you obtain that?

General O'REILLY. Sir, for this year I've had to stop the production of seven GBIs in production because we don't want to go forward until we've absolutely assured we've identified and resolved this design issue that's caused the most recent failure. So I am proposing to divert the funding that we would have had to build those

seven interceptors and to do more refurbishments and to support this ground testing, than we had originally planned.

Senator SESSIONS. So that looks to me like you're robbing Peter to pay Paul, and it raises the fundamental question, of does this budget give you enough money to keep the program on track and actually fix the failures. I know that you have difficulties. All of us in Congress, the White House, and the Secretary of Defense are saying watch spending, try to contain spending, and we all believe in that, trust me.

However, when we've done this much work and we're down to maybe $40 billion more has been spent on this project and we've hit a difficulty, we need to be able to go forward with it and we don't need to stop short of the number of interceptors we need in the ground and prepared.

So I guess my question is, in your personal professional opinion—and we ask you for that—do you have enough money to keep this program on track and to fix the challenges from the GMD system?

General O'REILLY. Sir, for fiscal year 2011 and for fiscal year 2012, because I have had to stop the production of the current GBIs and I am diverting that funding to fixing this problem and I'm using funding that was reserved for a flight test next year of the two-stage interceptor, which will have to move another year——

Senator SESSIONS. That will push the two-stage interceptor back.

General O'REILLY. Sir, without additional funding in fiscal year 2013 and beyond, there will need to be a delay of about a year of our overall flight test program that we were trying to complete by 2017. So that's one way to do it.

Right now, sir, I have the funding I need to address this problem because I've stopped my production line.

Senator SESSIONS. That has costs and ramifications also.

So I guess what I would say, Mr. Chairman, is that the DOD budget is tight. Just looking at the basic numbers on the MDA budget, DOD gets an increase as requested by the President, I think, in the House. But you have a reduction of, I estimate, about 5 percent in MDA's budget request; is that correct?

General O'REILLY. Sir, for fiscal year 2012 it's $48 million higher than fiscal year 2011, and fiscal year 2011 was $324 million higher than fiscal year 2012. So for this budget it's actually higher than last year.

Chairman LEVIN. You mean fiscal year 2010?

General O'REILLY. I'm sorry. I meant 2010. Fiscal year 2010 to fiscal year 2011 was $324 million higher than fiscal year 2010.

Senator SESSIONS. I think we should take a note here how alert the chairman is over here.

General O'REILLY. Yes, sir.

Chairman LEVIN. I apologize.

Senator SESSIONS. Somebody is watching the store. You get an A, Mr. Chairman. I'm asking the questions. I wasn't following that—I wasn't that quick.

Chairman LEVIN. I didn't mean to interrupt.

Senator SESSIONS. No, you do a fabulous job of keeping up with things.

General O'REILLY. Sir, I do believe in the near term, for fiscal year 2011 and 2012, however, as I've said before——

Senator SESSIONS. Next year you begin to bite. 2013, the budget is less than originally projected, is it not, the 5-year?

General O'REILLY. Yes, sir. Across the following 5 years, two things. First, we're finishing the heavy construction over fiscal year 2012. So the remainder of the work is focused on interceptors, flight testing, and upgrades. So that accounts for about half of it.

The other half is the efficiencies we're approving, sir. We have not reduced what we intended to accomplish, even though there's $2.4 billion less in the MDA budget. We have identified all of the steps we're taking so they can be accounted for and it will be evident we're either achieving it or we're not, these efficiencies, for the same amount.

Senator SESSIONS. Excuse me. You just noted, though, that you're delaying the two-stage testing and you're stopping the production of your interceptors. Both of those will add costs to the future.

We can talk more about where we are financially. I applaud you for the efficiencies that you've found, but I think there's no doubt, with the unfortunate failures of these tests, that it's going to hit our budget more than we expected, and we really need to see what we can do to keep your already-reduced plans from putting us in a situation we don't want to be in.

Senator NELSON. Thank you.

Chairman Levin.

Chairman LEVIN. Thank you, Mr. Chairman.

You say you stopped the production of the interceptors. I thought it was the kill vehicles which you've stopped production on.

General O'REILLY. Sir, it is the kill vehicles. I can't deliver the interceptor without the kill vehicles.

Chairman LEVIN. No, that's fine. But you said the production of the interceptors and I think you meant kill vehicles; is that correct?

General O'REILLY. That part of the interceptor, yes, sir, the kill vehicles.

Chairman LEVIN. On the funding issue, you're stopping production not to save money, but because you want to do testing first to make sure that what you produce will work; is that fair?

General O'REILLY. That's absolutely the case, sir. We did not anticipate this failure, and especially when it happened when the budget was already developed. So that was not to save any money. It is solely driven by we need to confirm the design works before we go back into production.

Chairman LEVIN. I totally agree with that philosophy, because I think you should know whether something works before it's produced and deployed, and there's been too many times where we've deviated from that course in the past, particularly in missile defense, for my comfort level.

But you're satisfied. Let me ask the other witnesses too. Do you all agree that it makes sense to not produce further kill vehicles until we have corrected the problem, so that when we do produce them we know that they're going to properly behave? Admiral, would you agree with that?

Admiral MACY. Absolutely, sir. It was one of the basic results of the BMDR that we would, if you will, fly before we buy. We would ensure that to the best of our ability within costs of testing and modeling and simulation that we would understand the performance of the systems. So when they are fielded, from my perspective representing the warfighter, I have confidence in their level of performance. So that I can build my operational plans to meet the need.

Chairman LEVIN. Dr. Roberts, do you have any difference with that?

Dr. ROBERTS. Ditto.

Chairman LEVIN. Now, General, last year I believe you displayed some frustration with the quality of some contractors' work, and you and I discussed the need to improve the MDA contracts to try to get more protection for the government against defects, which would require some defects clauses in the contracts.

Have you made any progress towards including defects clauses in the contracts?

General O'REILLY. Sir, we've worked with industry to get their feedback. I've worked with the leaders, the chief executive officers, of the major aerospace corporations and asked them for their ideas and help on this, so that it is most effective, these clauses.

The clause that we're looking at is not to indemnify industry from trying to achieve an unprecedented technical goal. That is the reason why we have cost-plus contracts. Unfortunately, when we find a failure mode that was caused by a quality, what we refer to as a quality escape—they didn't follow their own processes, their supervisors didn't catch it, and ultimately it caused a defective product—that's also today under our contracts protected by a cost-plus contract. It's the cost just went up.

An example is the first of the two GMD failures was caused because of a quality problem, and no matter how much additional money we added that wouldn't have resolved the root cause of that problem.

So where I am today is looking at the fee and looking at the profit that we're providing contractors and having the ability to go beyond the limited scope that we currently have in our award fees for quality control and extending it to a much greater pool of award fee money, even past-awarded money, so that the government can be compensated for egregious errors in quality control.

Chairman LEVIN. I hope you'll pursue that. As I understand it from our conversations, that first flight failure was due to a lock wire, if I have the right word, not being in place; is that accurate?

General O'REILLY. That is accurate, sir.

Chairman LEVIN. It was not where it was supposed to be?

General O'REILLY. Yes, sir.

Chairman LEVIN. Now, that is not something that the government should be losing money over as far as I'm concerned. I agree with you that you want the industry to be creative and if things fail because there's design problems and because we're taking risks, that's fine. That's what research is all about. But if you have a plan that says the lock wire, whatever that is, has to be here and instead it was put over here and we have a missile test failure because of that, that's a totally different deal as far as I'm concerned.

There is a role for cost-plus. We use it much too much, and I commend, by the way, Senator McCain and others on this committee for really joining in an effort to go after cost-plus contracts where they shouldn't be cost-plus. But I'm very much troubled by this. When you have a missile failure, a test failure, and it costs hundreds of millions of dollars and it's because something was not put in the right place according to the plan, then I think that the taxpayers should not be paying for that, and I hope you'll pursue that approach that you're using vigorously.

Do I have time? I don't know.

Senator NELSON. Go ahead.

Chairman LEVIN. I'd like to talk to you, Admiral, about the PAA to missile defense in Europe. As I understand it, you are responsible for assessing missile defense capability requirements of the combatant commanders. I believe that, after input from the combatant commanders, the Joint Chiefs unanimously recommended the PAA to missile defense in Europe. If that's true so far, can you tell us why from a warfighter perspective the military benefits of the EPAA to missile defense make sense?

Admiral MACY. Thank you, Senator. Yes, it makes sense because it provides us two opportunities. The first is an opportunity in time and the second is an opportunity in planning.

In the role of time, the PAA allows us to address the closer threat to Europe, the threat of medium-range, and intermediate-range missiles coming from the Middle East, whereas previously we did not have a method to do so prior to 2017 at the earliest with the so-called third site plan, which because of physics also would have had some limitations in defending some of the parts of Europe, those more to the south.

The PAA, being phased to our own technologies and adapted to the threat, gave us a way in which to organize our thoughts and our plans to take advantage of the near-term capabilities that are present in Aegis and in THAAD, developed by MDA, to address those near-term threats to Europe. So that's a time issue. Basically, we can address the threats to Europe much sooner than we would have been able to.

The second is in the flexibility and the capability of the system. It allows us to adapt to changes that may appear in enemy intent and the emergence of threats from another area. We have done most of our planning for threats coming from one particular country or set of countries and part of the region. If another were to develop this capability, it would allow us to adjust faster.

It would allow us to increase or decrease the capability based on the amount of threat. It allows us opportunities for partners to take part in the missile defense of Europe by having more opportunities for ways in which they can connect with our system and come up with an allied approach. Whereas previously it was a unitary system linked to the homeland defense BMD capability and there was not a real practical way to have the partners involved.

So we have flexibility in capability, we have flexibility in the alliance, and we have the opportunity to address threats on a more timely basis.

Chairman LEVIN. Thank you.

Thank you very much, Mr. Chairman.

Senator NELSON. Thank you, Chairman Levin.

Senator Udall.

Senator UDALL. Thank you, Mr. Chairman.

Welcome to all of you. Thank you for being here today.

Let me start with this. As we develop active defense networks to counter advanced ballistic missiles, deployed American forces and some of our allies, as we know all too well, are faced with the threat of low-tech rockets and missiles. Some of these weapons don't require a lot of technical knowledge for the user. They can be launched from the backs of pickup trucks and they're easily hidden.

How do we strike a balance between countering complex systems and those that are basically flying improvised explosive devices (IED)?

Admiral MACY. Senator, that falls into the, if you will, larger realm of which I am responsible, which is integrated air and missile defense (IAMD), where we look at the defense of the Homeland, of own forces and partner forces from all threat objects arriving in the atmosphere, regardless of source. So we look at the IAMD architecture, the IAMD capability, across the board to address that.

We have an IAMD operational architecture, a formal way of looking at what decisions and information are there made at each stage in that process, who has to make them, and who they have to provide it to. This has been done in a very rigorous and organized fashion, in accordance with the operational architectural framework.

We coordinate with program providers across the spectrum of air and missile defense at the program level, how they fit into that operational architecture, and how they address these issues. Recently we've had a number of discussions with the Army in particular on countering rockets, artillery, and mortar issues, and what needs to be done, what are the requirements, what are the current capabilities, and what are the shortfalls.

We serve, as I said earlier, at the nexus of how this is done within DOD. We participate with the Services in their development of classic air defense systems through the joint capabilities process, and we participate with STRATCOM, who has the responsibility as the air and missile defense integrating authority to look at those requirements across the spectrum of threat.

In the BMD world, we look at the prioritized capabilities list, the achievable capabilities list, that's generated by STRATCOM with the combatant commanders, and the dialogue that goes on with MDA over the programs that General O'Reilly is asked to provide.

So we are the nexus across that span of questions from rockets, artillery, mortars, long-range rockets, short-range ballistic missiles, manned bombers, fighter aircraft, et cetera. I don't know if that answers your question, but that's how we try to put it together, then integrate both solely service programs—Army air defense, Navy air defense, Air Force air defense capabilities—with joint programs, how they work together.

We conduct a number of studies on that, one of the most significant being a series of exercises known as Nimble Fire, where in a classified environment we can bring together the air defense capa-

bilities of all of the Services and see how they interact. We've been involved in all of these discussions that we've had here today.

Senator UDALL. I may want to follow up with some additional questions for the record.

General, did you have anything to add, or Dr. Roberts?

General O'REILLY. Sir, in my charter it does not cover the very short-range rockets you referred to. So I develop typically a Scud threat and beyond. I have been asked by Congress and we do co-manage some Israeli programs that are short-range, such as the David's Sling. But even what you're referring to is more in the realm of the Iron Dome system, which was not part of our development, but I have been watching that and I have seen it's been successful in its recent deployment against very short-range rockets.

Admiral MACY. Senator, I'd like to add, if I may, sir, that I'm frankly very proud of the very close liaison between my staff and that of MDA, where we look at these intersections very closely to understand where there are opportunities for exchange of information, exchange of data and capabilities.

So it's not that one part of JIAMDO is doing air defense and another part is doing ballistic missiles. We are very closely integrated with MDA as well as with the service engineers. We understand this is a spectrum of capability.

Senator UDALL. It's hard to see it being a threat in a broad-based way to our forces, but General O'Reilly mentioned the situation in Israel and I think that that has political elements as well as military elements, and the political elements can affect the military situation and the stability in the region. The more we develop the capacity to counter flying IEDs, in some ways the better.

I'll follow up with some additional questions on cost and so on. I want to use the second half of my time, if I have some left, to turn to GAO. Ms. Chaplain, you're here, and thank you for your good work. You talked about some aspects of MDA's flexible acquisitions process that create what the report describes as "down sides" for oversight and accountability. I know that DOD concurred with some of the GAO recommendations and that MDA has made some significant progress. But there are some recommendations that DOD still disagrees with, and I'd like you just to discuss those, if you would, and then give General O'Reilly a chance to respond.

Ms. CHAPLAIN. Yes, there were some disagreements. Our recommendations focused on where we thought MDA could further improve the reporting that it had started. One issue, for example, was with regard to sunk costs for targets, and we believe those sunk costs should be reported and pretty clear, and MDA only partially agreed with that. They didn't feel like that would fit the way they want to report targets and that it's difficult to report some of the heritage costs in targets.

But our concern was even MDA sunk costs weren't reported and we felt that they need to be, and to the extent the other costs can be or cannot be found that needs to be disclosed.

We also had some partial disagreements on the way testing is planned. We encouraged MDA to make test plans more realistic. There are often failures in testing and a lot of rework going on. We thought maybe some additional time and resources should be built into the plan, and they only partially agreed with that rec-

ommendation. I think it's just part of the issues involved with testing. As General O'Reilly said, they're very expensive tests to conduct and it might require more resources upfront.

But our goal is to avoid a lot of the rework that goes along with a test plan that's not fully stabilized yet.

Senator UDALL. Thank you.

I think my time has expired, so, General O'Reilly, I'll have you respond for the record, if I might, so that Senator Shaheen can ask some questions.

I would just add that when I was a businessman I on the one hand loved seeing my auditors and on the other hand I wasn't all that happy to see my auditors. So thank you for what you do. I know General O'Reilly and I have had some conversations and he takes seriously your insights and has made some real improvements and is notably and understandably proud. I look forward to your responses for the record. I did want to yield so Senator Shaheen can ask her questions.

Thank you.

Senator NELSON. Thank you, Senator.

[The information referred to follows:]

Ms. Chaplain raised two issues, one regarding reporting sunk costs of targets and one on adding additional time and resources to execute our test programs. I will respond to both.

Target sunk costs are not reported in MDA program baselines. Targets are developed in support of separate and distinct Ballistic Missile Defense System (BMDS) test events and do not follow a traditional DOD weapon system procurement process. As the test program adjusts, the quantity of targets in the baseline adjusts as well. Additionally, each target is inherently a test article and no two are truly identical. As such, there is not a clear quantity of targets to be procured over the lifecycle in order to amortize the non-recurring engineering costs.

MDA strives to reuse previously developed and procured strategic missile components in our targets program, so including all sunk costs would not accurately reflect program costs. Accordingly, MDA uses the costs incurred or planned during the Future Years Defense Program to calculate unit costs.

The Integrated Master Test Plan (IMTP) is defined well enough over a 6-year period to provide a reasonable baseline from which target needs can be defined and targets can be procured.

With respect to the second issue raised by Ms. Chaplain, MDA builds available schedule and resource margin into the test baseline in order to stabilize, to the extent possible, the test program and minimize rework in test planning and execution.

MDA continuously evaluates the availability and allocation of test resources to ensure all components of the test program (e.g., range availability, target availability, range safety systems, data collection assets, et cetera) are synchronized. MDA thoroughly analyzes all test results (successes and failures) to ensure test objectives were met. When analysis determines an objective was not fully met, it is assessed for inclusion in a future test event. This continuous evaluation allows MDA to reallocate resources based upon test results, priorities, and warfighter requested capabilities. The IMTP has defined flight and ground test plans, at both the system and element levels, that can be adjusted based upon emerging test results or changing warfighter requirements. Test delays, accelerations, cancellations, and additions are analyzed using established MDA processes to update the IMTP and maximize the use of planned test events for additional data collection.

Senator NELSON. Dr. Roberts, you in your testimony referred to the hedge options. It's my understanding that DOD has been planning to implement a number of these hedge capabilities and I understand that DOD is currently conducting an analysis. Do you have some idea of when this analysis of the hedge options would be finished, and is it possible that you would brief us at the time that you have those options analyzed and under consideration?

Dr. ROBERTS. Yes, we're committed to brief you as soon as we have the Secretary's review and decisions in this area. Frankly, we expected that to be by now. We thought we'd have more to say in this hearing about the hedge. But of course, other events have intervened and we expect within a matter of a few short weeks.

Senator NELSON. General O'Reilly, are you confident that the MDA will be able to deploy additional GBIs at the eight extra silos at Fort Greely in a timely manner if DOD chooses to do so?

General O'REILLY. Sir, we're going to need to complete the additional missiles that are currently stopped in production in order to do that. As soon as we have those completed, we will have at that point, I believe, over 10 missiles additional for those 8 silos, sir. So I will get back to you on the record the exact delivery dates for those remaining missiles.

[The information referred to follows:]

Pending the outcome of the Failure Review Board, once the corrections to the missiles are made, MDA will prioritize repair of both emplaced missiles and Ground-Based Interceptors (GBIs) in production. While no decision has been made to fill additional silos in Missile Field 2, if directed to do so, eight additional GBIs will be available for emplacement by the end of fiscal year 2015.

Senator NELSON. Okay, thank you.

Admiral Macy, can you explain how DOD assesses how many missile defense interceptors are required to meet the needs of the combatant commanders? I presume it's not as simple as planning to have at least two interceptors for each adversary ballistic missile so we can shoot at every missile. But if you could help us understand how the COCOMs and the military view the actual role of missile defense and the force structure that they need.

In other words, how does missile defense fit into the larger picture of a COCOM's missions and capabilities?

Admiral MACY. Yes, sir. I'm looking forward to addressing that. To begin with, it's important to note that BMD capability as we have been talking about it today is not an isolated mission. As you pointed out, it's on the warfighters' planning. It's part of a larger campaign against an adversary.

I shorthand it sometimes that BMD does not defend you against ballistic missiles. Ballistic missiles are an action taken by an adversary for a political result. BMD provides part of the national capability to deal with that potential threat or to deal with the event should it occur.

So what BMD allows us to do is to prevent the adversary from winning the fight with the first wave. What it does is to provide the requisite level of protection for critical forces and nodes and capabilities sufficient for the combatant commander to bring all the other elements of national power to bear to get the enemy to change his behavior, because in the end that's what you're trying to do, is to change the enemy's behavior.

The goal is not to just simply sit there and keep taking incomings. As you pointed out, it's not practical. The number of threat missiles in the world already exceeds our inventory and will continue to do so. So buying missiles equal to twice the number is just not practical.

So what we look for and what we have done in the JCM–III study is to look at that from a warfighting perspective: How long

can BMD capability provide the requisite level of protection to those critical assets that the combatant commander has identified so that he can take other steps necessary to change the enemy's behavior, to stop the enemy's use of ballistic missiles?

That's from an operational perspective. From a planning perspective, demonstrating that having sufficient capability may assist in deterring the enemy from contemplating the use of ballistic missiles, knowing that he will not be successful in his initial attacks, and he can remain confident that the reaction of the United States is going to be significantly more than simply defending against the incoming.

Senator NELSON. How does the Joint Staff allocate the number of missile defense systems to the various combatant commanders, who I'm sure are competing to one degree or another for those assets?

Admiral MACY. Yes, sir. It's a safe bet that each of them has a list which is a little bit longer than the one I have.

It is part of our global force management process, which is our formal process to assess the operational plans and requirements of each combatant commander, to understand the risks and the rewards of allocating them different capabilities. This is true across the board, whether it's BMD ships, whether it's long-range bombers, whether it's infantry brigades, for their different needs.

We have an ongoing process through the Global Force Management Board to understand their needs and their requirements, to balance across the forces what we have available, and to use that information to essentially do two things. One is to feed back through the Secretary to the development community and the budget community what we need to increase because we assess the overall risk as being too high and, until we have those, to give to the Secretary that information he needs to make the decision on what risks he's going to take and where he's going to take them.

Last year we looked very carefully at the issue of BMD forces with the Global Force Management community. We are folding that into the community. STRATCOM is currently leading an effort among the three COCOMs plus U.S. Northern Command to understand how all of their different plans fit together and to understand how we would apportion and allocate forces in the near term and over time as we get more capability to each one of those.

Senator NELSON. So at the end of the process, is it the Secretary who makes the decision or is it brought to the Secretary's attention and the Secretary either assents or dissents to it?

Admiral MACY. Every deployment order is a decision by the Secretary in his role on behalf of the President as the command authority, whether it's for a ship or for a brigade. We have a process that goes on every week. It's called the Dep Ord Book. It's the Deployment Order Book, where the movement of forces, the reassignment of forces, goes through a review process among the COCOMs, goes through the Joint Staff, is reviewed by the Chairman in his role of providing military advice, and then is presented to the Secretary, and he literally signs off each page. His initials go on: "yes", "no", or "come see me".

Senator NELSON. Thank you.

Senator Shaheen.

Senator SHAHEEN. Thank you, Mr. Chairman.

I just have a final question. I was interested in the back and forth around Israel's Iron Dome and David's Sling program and the Arrow program, because I had the opportunity to visit Israel last summer and be briefed by their director of the missile defense program on those systems. I actually think we should take a lesson in terms of naming our systems. I think theirs are quite descriptive.

But what I was interested in is, you mentioned that the Iron Dome technology was Israeli and I know that we contribute to the work that's being done there, so I wonder if you could talk about what we have learned from the technology that's been developed and how much of that is shared and whether we are actually incorporating any of that into what we're doing here.

General O'REILLY. Senator, actually the Iron Dome is one of the few Israeli programs that's totally developed by them. So we do not have a sharing agreement with them. David's Sling, we provide 50 percent of the funding and they provide 50 percent of the resources. Our companies, such as Raytheon, work with that development so that they have the proprietary rights and the information rights to develop that type of capability should we want David's Sling. The same with Boeing on Arrow 3. Those two programs, in which we are investing approximately half of the resources, we do not—first of all, our industry team is working on those programs, so they see the details of the technology, and we have the rights to that technology. There are certain limitations, but all that is pre-agreed to prior to the start.

But in the Iron Dome, that is not a MDA program. I have been asked to provide funding out of my budget for the procurement of Iron Dome. So we're ready to follow the guidance of Congress in that regard. But I don't participate in the actual management or the development of that capability. But I've reviewed it.

Senator SHAHEEN. Where are we in terms of the procurement? There has been a request from Congress, but have we done anything on that?

General O'REILLY. Senator, I need this year's budget, fiscal year 2011. It's in the fiscal year 2011 budget, $205 million for the MDA for the procurement of that for Israel.

Senator SHAHEEN. If we do contribute to that, what would we learn from that and will we be able to take advantage of any of the procurement efforts?

General O'REILLY. Once we have the budget, I will begin that process. But we have not begun that, those agreements with the—and the office in Israel that you were referring to, they also were not responsible for the development of Iron Dome. That office, we work together closely every day. So this is something we're going to have to determine ahead of time of the agreements. That hasn't occurred yet.

Senator SHAHEEN. So who developed the Iron Dome technology?

General O'REILLY. I know the company is Rafael and I've been out there. I've seen their testing. It's very impressive for what it can do.

Senator SHAHEEN. Thank you.

Thank you, Mr. Chairman.

Senator NELSON. Thank you, Senator.

Ms. Chaplain, when GAO makes recommendations for MDA to improve its program management, DOD formally indicates its view of those recommendations. I believe in response to recommendations in your report in March, DOD either agreed or partially agreed with all your recommendations. Your report and your testimony indicate that MDA has made significant progress in improving the accountability and transparency of its programs.

If MDA implements the recommendations in your report, how far will it have come toward what you would consider an acceptable level of transparency and accountability?

Ms. CHAPLAIN. If they implemented all the recommendations, they will have come a very long way in getting the things that we want to see for accountability and transparency. There are some actions that need to be taken that shouldn't be taken lightly. One thing we're looking for, for example, are independent cost estimates (ICE) and MDA has just started that process. So that's going to take some time.

Another thing we're looking for is backing cost estimates with all the data and documentation you need to trace and verify them and to really understand them in an easy way. That wasn't present this round. I think they'll be more present the next round.

Along with the transparency and accountability of just what they report to Congress, we would like to see a few other things happen. One is just stabilizing the acquisition approach. We've had three different ways of reporting on progress for the missile defense system and each time we change those ways it becomes very difficult for us to go backwards and track costs back in time and schedule and progress.

We'd also like to see some of the things we recommend extend to the efforts like EPAA, where we can learn more about costs and schedule within that effort. Then we'd also like to see the structure and the clarity of MDA's budget request improve as well.

So there's more beyond just what you see on paper, but I think if everything that we're asking for in this round is implemented it will be just a huge amount of progress that's been made.

Senator NELSON. Thank you.

General O'Reilly, have you determined what or how many of the recommendations you may be seeking to implement?

General O'REILLY. Senator, we believe GAO has accurately captured the challenges which missile defense has to operate in, but at the same time—the management challenges. At the same time, we are on a path to accomplish the ICE. As she has said, there's been recent changes. I've made most of those changes, to enhance the baseline reporting.

This was the second year we've done it in a row. This year's report that we submitted to Congress wasn't taken into account. The delivery was after this GAO audit was done. We believe that has each year more enhanced accuracy and the level of detail they're looking at.

The one area in which we disagree with the GAO's recommendation—Ms. Chaplain just referred to it before—is in the area of our targets. We feel that we reuse—because we have to find intermediate-range and ICBM-type targets, instead of buying brand-

new targets. We go out and work with the Air Force and the Navy and we identify retired missiles, and then we modify those missiles and make them into a target.

Now, the cost of the original missile we don't believe accurately reflects the cost to MDA of achieving that target. I know GAO looks at it as the cost to the government, but those missiles were bought for a particular reason, they were retired, and we've taken them out of retirement. We do agree with GAO we should capture all of the costs of modifying those missiles, but there's a difference there that we're still in discussions with the GAO on.

Senator NELSON. In that regard, I know that you've changed some of your acquisition requirements and contracting requirements now where you get competitive bidding for contracts. Could you tell us a little bit about what you've been doing there and maybe some of the cost savings that the agency has achieved?

General O'REILLY. Sir, of our $2.4 billion that was identified in efficiencies by MDA this year, almost a half a billion was due to the way in which we acquire contractor support for government agencies or government staff. In the past, we used to hire—we determined and told our contractors how many engineers we needed and of what seniority and what were the particulars of the resources we wanted these companies to provide us to augment our staffs. Instead, we're taking a different approach. We define the task that we want these companies to provide for us and we leave it up to the companies to determine the seniority and number of engineers.

We do this in a competitive fashion, so they know they're competing for cost, schedule, and performance of their competitors, against their competitors. This year we've identified so far over $100 million in savings because of the way that contractors have proposed. It may be an equal amount of personnel or it may be even more, but it might be fewer senior engineers that cost more, more mid-level, and then some junior engineers, which industry has told me in the past the way we were contracting was preventing them from literally hiring and developing a new generation of engineers.

So this has worked quite effectively for us, sir. We do have about $30 billion more of contracts over the next 5 years which we are looking to compete.

Senator NELSON. General O'Reilly, given the two failed GMD flight tests, you're planning to conduct two more flight tests to verify the solution for the problem encountered in the test, and you've indicated that you will need some additional GBIs for the GMD test program, but that number hasn't yet been determined. I understand that you plan to assess the need for additional GBIs after the flight tests verify and demonstrate the solution to the GBI problem we've been discussing.

Is that correct? Since the GBI production line will remain open for several years and the refurbishment and target programs will also keep that production line busy, we'll have several years in which to decide how many additional GBIs are needed. In other words, we don't need to decide that this year; is that assumption accurate?

General O'REILLY. Yes, sir. We believe that through this failure review board process one of the outcomes will be what is the right number and the strategy for testing GBI reliability in the future. We already have a program that we plan over the next 10 years to test over 900 components off the missiles that are currently in the missile fields as we refurbish, as you say. But we will reassess what additional testing is needed beyond that.

Senator NELSON. This is to both General O'Reilly and Dr. Roberts. Your prepared statements discuss a number of planned enhancements to the existing GMD system to increase the capability to defend the Homeland over the coming decade. General O'Reilly, can you summarize the enhancements briefly and describe the degree to which they are expected to improve our defenses and over what period of time are we looking?

General O'REILLY. Sir, there are several studies that are being done independently and they all indicate that—one of them, including Admiral Macy's study that he just finished—one of the key indicators to the effectiveness of missile defense is not actually the number of interceptors—you do need a certain amount—but it is the sensor system and our ability to discriminate objects and determine which is the reentry vehicle (RV) with enough certainty in order to affect your firing doctrine, how many missiles are you going to shoot at that cluster of objects?

All missiles when they're launched have associated objects that come with them—upper stages, shrouds, other components that come off the missile during powered flight. So we have to have the ability to determine where is the RV to hit it. Those types of upgrades to the sensor systems, as I've mentioned, Clear, AK, those algorithms will have a significant impact on our capability.

Also, the East Coast communications system will, in fact, significantly enhance the protection of the United States because we can communicate with the GBI late in flight before it has to intercept any threat that's coming from the Middle East.

Those are, the ability to discriminate, the ability to use our new sensors like our satellite systems and even our forward-based airborne platforms and forward-based radars, those totally combined give us a very early track, and with the SM–3 IIB we would be able to intercept. Our cost estimate of that interceptor is about $15 million, so it's very cost-effective for the first layer of defense for Homeland defense. It doesn't replace the GMD system, though, that still is necessary.

Senator NELSON. Dr. Roberts, how do you see these GMD enhancements fitting into our overall missile defense strategy?

Dr. ROBERTS. To go back to your opening formulation, we're ahead of the threat of limited strikes from states like North Korea and Iran, and we want to make sure that we stay ahead. A part of that is on the quantitative side. We want to be sure that we have the ability to provide sufficient interceptors, a sufficient number to match the requirement.

But we often forget the qualitative side, and we can significantly enhance the performance of the current system and prepare it for substantially enhanced performance when the SM–3 IIB becomes available to us. So we see these capabilities enhancements as essential. They are separate from the hedge, meaning these are

things we're going to do in any case because they're important to staying ahead, and the hedge involves a set of things that we might want to do that are in addition, in the case of a more early emergence of capabilities that would overwhelm the GMD system.

Senator NELSON. In that regard, my colleague, Senator Sessions, was raising questions about the budget for what I would call the out years, from 2013 on, and raised a question about whether or not that was sufficient funding for that period of time. Dr. Roberts, do you have any thoughts about how you might respond to that?

Dr. ROBERTS. You had two good answers from the same military advisers that we listen to in Policy on this topic. We are satisfied that the budgets as projected are sufficient to our purpose. We don't see any opportunity for additional savings.

We have a clearly emerging threat in the regions. We have the challenge of staying ahead in the defense of the Homeland. We have future technologies that we'd like to be invested in to ensure that we remain competitive over the very long term. We have a testing program that we've all accepted needs to be robust and sustained over the long term. There's no significant opportunity there for additional savings.

So Policy clearly has the view that there are not significant new savings to be realized in the BMD budget if we're committed to the policy principles articulated in the BMDR.

Senator NELSON. General O'Reilly, do you have any thoughts you'd like to share?

General O'REILLY. Senator, as Dr. Roberts laid out, our current budget, the question that Senator Sessions was referring to, it was aimed at efficiencies. We're still intending to accomplish the same scope, and we've done this in a way that's auditable to determine are we more efficiently buying this capability. It was not determined nor is it our intent to reduce the amount of work that we plan to do in fiscal year 2011.

As Dr. Roberts was saying, the hedge strategy would be additional, if we executed those hedges, would be beyond what was in our current budget.

Senator NELSON. So we would have to increase the budget at some point down the road to take into account these additional efforts at defense?

General O'REILLY. If those efforts are turned on, yes, it would require additional funding.

Senator NELSON. My final question is, is there anything we should have asked that we didn't ask?

General O'REILLY. No, sir.

Senator NELSON. Very politic.

Thank you very much, all of you, and thank you for your service to our country. We appreciate it.

The hearing is adjourned.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR CARL LEVIN

PHASED ADAPTIVE APPROACH

1. Senator LEVIN. Dr. Roberts, General O'Reilly, and Admiral Macy, in September 2009, the President announced his decision to accept the unanimous recommendation of the Secretary of Defense and the Joint Chiefs of Staff to pursue the Phased

Adaptive Approach (PAA) to missile defense in Europe. He described each of the four phases of the PAA, including the planned deployment timeframe for each phase. As explained in the Ballistic Missile Defense Review (BMDR), it is U.S. policy that "before new capabilities are deployed they must undergo testing that enables an assessment under realistic operational conditions against threat-representative targets to demonstrate that they can reliably and effectively help U.S. forces accomplish their mission." Do you each agree that this central fly-before-you-buy policy criterion should be applied to each phase of the European PAA (EPAA), so that we have confidence that the systems will work before we deploy them, and so that we only deploy systems that have demonstrated that they will work?

Dr. ROBERTS and Admiral MACY. The fly-before-you-buy policy as outlined in the BMDR should and will be applied to each phase of the EPAA. The EPAA was specifically designed to take advantage of capability developments as they became operationally available, which includes realistic testing of the systems as they are fielded.

General O'REILLY. A key tenet of the BMDR is to sufficiently test the capabilities and limitations of a missile defense system before we begin procurement, or fly-before-we-buy.

FUTURE CONTRACT IMPROVEMENT OPPORTUNITIES

2. Senator LEVIN. General O'Reilly, you have indicated that future Missile Defense Agency (MDA) contracts will provide opportunities for increasing value and protection to the taxpayer, including through increased competition and enhanced contract terms to protect against defects or other unsatisfactory contractor performance. What are your plans and objectives for improving these future MDA contracts, and what enhancements do you expect to achieve, in terms of savings or other enhancements?

General O'REILLY. MDA awards contracts for hardware and services using both competitive and noncompetitive procedures. We continually look at our existing contracts and all new requirements for future competition opportunities. By conducting market research, we are able to define the extent to which system components or services can be competed in the future. Where necessary, we plan to obtain technical data under existing contracts to facilitate future competition. Additionally, MDA has implemented a competitive procurement strategy for the acquisition of our advisory and assistance service support requirements. This support is obtained using competitively awarded task orders under multiple award contracts. We are committed to ensuring maximum competition is planned for and considered in all acquisitions.

To address recent unsatisfactory contractor performance, MDA has developed a draft contract provision, titled "Contractor Accountability for Quality." This provision will allow MDA to reduce or even eliminate the amount of performance incentive fee awarded when our prime and subcontractors fail to follow their own best practices, internal processes, or accepted industry standards which then result in quality problems. We intend to include this provision for the first time in the Ground-based Midcourse Defense Development and Sustainment Contract. We plan to incorporate a contract provision holding contractors accountable for quality in all applicable MDA contracts.

COUNTERFEIT ELECTRONIC PARTS

3. Senator LEVIN. General O'Reilly, the committee has initiated an investigation into the presence of counterfeit electronic parts in the defense supply chain. MDA has taken steps to mitigate the risk of counterfeit electronic parts finding their way into our missile defense systems. From MDA's perspective, how serious is the problem of counterfeit electronics?

General O'REILLY. MDA recognizes the seriousness of counterfeit electronic parts in the defense supply chain and has developed an effective process to identify and remove them. Specifically, to date MDA has experienced six instances of counterfeit parts within our supply chain which is made up of thousands of unique parts and materials provided by hundreds of suppliers providing hundreds of assemblies. One of the counterfeit part incidents required a recall of 49 mission computer assemblies which necessitated the removal of approximately 800 parts from inventory. Counterfeit electronic parts in the defense supply chain can affect overall system quality and reliability if not properly addressed.

4. Senator LEVIN. General O'Reilly, what national security risks result from the presence of counterfeit electronic parts in the Department of Defense's (DOD) supply chain?

General O'REILLY. The predominant risk is reduced reliability and availability of weapon systems due to the failures related to counterfeit parts and materials. A counterfeit part may pass all production testing. However, it is possible that the part was damaged during unauthorized processing (e.g., removing the part from a previous assembly, or sanding the surface in order to place a new part number) causing the deployed system to fail. Similarly, reliability may be affected because a counterfeit part may be near the end of its useful life when it is installed. Should any mission critical component fail, that system fails and national security is impacted.

A more insidious risk is the potential for access or the ability to disable a weapon system or communication network through malicious circuits embedded in counterfeit devices. Testing for this type of defect is extremely difficult.

5. Senator LEVIN. General O'Reilly, many of our defense systems rely on parts that are no longer in production, forcing agencies to purchase them from places other than the original manufacturer. What steps has MDA taken to ensure that their sources of supply for obsolete parts are trustworthy?

General O'REILLY. Understanding and controlling the source of parts and materials is critical in reducing the counterfeit part risk. Our MDA Parts, Materials, and Processes Mission Assurance Plan (PMAP) requires parts and materials for new or modified mission and safety critical hardware to be purchased only from the original manufacturer or an authorized distributor. MDA realizes that there are cases when obsolete parts are no longer available from the original manufacturer or an authorized distributor. In these cases, MDA PMAP requires that the contractor justify the reason why an authorized source was not available and provide a plan for verifying authenticity of the part. MDA Policy Memo #50, released in June 2009, extended these requirements to also include heritage mission and safety critical hardware.

6. Senator LEVIN. General O'Reilly, has MDA adopted any policies or procedures to mitigate the risk of counterfeit electronic parts that DOD should consider adopting?

General O'REILLY. MDA established requirements for mitigating counterfeit parts dating back to October 2006. At this point, MDA's requirements sufficiently mitigate the risk of counterfeit parts. There are other standards that are being developed. For instance, SAE is currently developing a comprehensive standard. MDA is participating in its development. DOD may want to look at all the standards and determine how such requirements should be imposed.

MISSILE DEFENSE COOPERATION WITH RUSSIA

7. Senator LEVIN. Dr. Roberts, your prepared testimony states that, "a key priority is to establish a cooperative [ballistic missile defense] relationship with Russia. Significant opportunities have emerged, along with some challenges." You also state that you believe "we have an opportunity for meaningful cooperation" that will enhance security. Why do you believe such missile defense cooperation would be in our security interests, and do you believe it could send an important signal to Iran that the United States and Russia are both opposed to its developing nuclear weapons and long-range missiles?

Dr. ROBERTS. Cooperation with Russia in our missile defense efforts would send an important signal to Iran that Russia and the United States are working together to counter the acquisition, deployment, and use of ballistic missiles. Effective Ballistic Missile Defenses (BMD), including a potential U.S.-Russia cooperative architecture, can also devalue Iran's ballistic missile arsenal by reducing its confidence that an attack would be successful. This would help undergird a broader strategic objective: to strengthen deterrence in key regions through the integrated and innovative use of military and nonmilitary means that adapt regional deterrence architectures to 21st century requirements.

8. Senator LEVIN. General O'Reilly, your prepared testimony states that you are, "optimistic . . . that we will make significant progress this year in cooperating with the Russian Federation on missile defense." Why are you optimistic, and what sort of cooperation do you anticipate?

General O'REILLY. We continue to support expert dialogue on cooperative efforts with the Russian Federation whose surveillance radars would enhance our ability

to monitor ballistic missile development and flight testing in Southwest Asia. There are opportunities for us to cooperate in sharing our sensor data, our future research and development, and our command and control activities and exercises in order to build confidence between both sides that we're not threatening each other, but we are building ourselves a defense against the proliferation of these missiles.

DEFENSE TECHNOLOGY COOPERATION AGREEMENT WITH RUSSIA

9. Senator LEVIN. Dr. Roberts, your prepared testimony describes the administration's effort to conclude a Defense Technology Cooperation Agreement (DTCA) with Russia as a "requirement for the safeguarding of sensitive information in support of cooperation" on missile defense. Please describe the role and purpose of such a DTCA, and why you believe such an agreement would be necessary to permit missile defense cooperation with Russia.

Dr. ROBERTS. To facilitate greater cooperation with Russia, we need to conclude a DTCA, which will be beneficial not only for missile defense cooperation, but for cooperation in other areas, such as counterterrorism.

We have made clear to Russia that we must complete a DTCA in order to undertake more extensive BMD cooperation. The DTCA will contain an annex that addresses the exchange of classified information. Even with a DTCA in place, a National Disclosure Policy review will still be required to provide classified information to Russia.

NATIONAL DISCLOSURE POLICY

10. Senator LEVIN. Dr. Roberts, you indicated that, in the context of possible missile defense cooperation, the United States would not share classified information with Russia unless and until we have conducted a National Disclosure Policy review. Please describe what such a review entails and how it would protect our information.

Dr. ROBERTS. The DTCA will provide a legal framework to support defense technology cooperation between DOD and the Russian Federation Ministry of Defense for projects (classified or unclassified) to include missile defense and counter-improvised explosive device projects.

All projects involving classified information that will be undertaken with the Russian Federation under the DTCA will require review and approval by the interagency National Disclosure Policy Committee (NDPC). An exception to the National Disclosure Policy must be authorized prior to the release of any information on a program involving classified information. Exceptions to the National Disclosure Policy may be authorized personally by the Secretary of Defense or his Deputy or the NDPC.

NDPC reviews result in well-coordinated and informed interagency decisions regarding the types and level of classification of military information and projects authorized for disclosure, as well as specific conditions and limitations to be applied when sharing classified information and technology with a foreign government.

QUESTIONS SUBMITTED BY SENATOR E. BENJAMIN NELSON

FLIGHT TEST FAILURES

11. Senator NELSON. General O'Reilly, the Ground-based Midcourse Defense (GMD) system currently has 30 Ground-Based Interceptors (GBI) deployed to provide defense of the Homeland against limited missile attacks from countries such as North Korea and Iran. However, the last two flight tests of the system failed to intercept the target. Can you explain what happened, what you are doing to fix this problem, and whether these test failures affect the deployed interceptors?

General O'REILLY. For FTG–06 in January 2010, the Exoatmospheric Kill Vehicle (EKV) lost attitude control during the acquisition phase and failed to intercept the target. The failure was traced to an EKV quality control problem, a missing lockwire on an attitude control system thruster. Corrective action, manufacturing, and inspection procedures have been modified and there was not a recurrence of this problem in the two subsequent flight tests: BVT–01 in June 2010 and FTG–06a in December 2010. This issue impacts both CE–I and CE–II interceptors; however, records and photographic evidence have been reviewed for every delivered GBI to support a comprehensive risk assessment and no other instances were identified.

During FTG–06a in December 2010, the EKV lost track of the target during the discrimination phase and failed to intercept the target. The failure investigation is

ongoing and final determination of root cause/corrective action has not been made. However, GMD is developing/testing multiple potential corrective actions and plans to validate the correction during the next flight test (non-intercept test FTN–01) in fiscal year 2012. Preliminary indications are that the failure is unique to the CE–II GBIs. Testing and analysis that the original deployed interceptors are not affected by the failure mode seen in FTG–06a is underway.

12. Senator NELSON. General O'Reilly, will you brief this committee when the Failure Review Board has completed its review and you have decided on a plan for how to fix the problem?

General O'REILLY. Yes.

PHASED ADAPTIVE APPROACH

13. Senator NELSON. Admiral Macy, it appears that some view the PAA as a specific system or architecture, with a fixed number of assets and capabilities. However, as explained in the BMDR, it appears more like a strategy or an approach than a system or architecture. Can you provide your view of whether the PAA is an approach to missile defense or a specific system architecture?

Admiral MACY. The PAA is not a specific system architecture or acquisition program. It is a conceptual approach that provides BMD capability for our deployed forces, allies, and partners, and additional capability for Homeland defense, in different regions, circumstances, and times. The PAA provides a balanced investment with the capacity to engage the range of threats that can be tailored to the geography, political circumstances, and capabilities of regional partners. It also has the flexibility to rapidly deploy more assets where and when they are needed.

14. Senator NELSON. Dr. Roberts, you helped develop the policy and strategy for the PAA. What is your view?

Dr. ROBERTS. I agree with Admiral Macy that the PAA is not a specific system architecture or acquisition program. It is a conceptual approach that provides BMD capability for our deployed forces, allies, and partners, and additional capability for Homeland defense, in different regions, circumstances, and times. The PAA provides a balanced investment with the capacity to engage the range of threats that can be tailored to the geography, political circumstances, and capabilities of regional partners. It also has the flexibility to rapidly deploy more assets where and when they are needed.

15. Senator NELSON. Ms. Chaplain, as explained in the BMDR, DOD developed the EPAA as a regional policy approach for missile defense of Europe, not as a specific acquisition program. Can you explain why the Government Accountability Office (GAO) seems to be evaluating this policy approach as if it were a new major defense acquisition program?

Ms. CHAPLAIN. At the request of the House Armed Services Committee, GAO conducted a broad assessment of DOD's planning for implementation of the EPAA policy. Although we understand that the EPAA is a policy approach, not an acquisition program, it is an investment in a subset of MDA's systems requiring coordination and technical integration to be deployable in the European region, and to meet the timelines set out in the policy. In our view this represents a significant acquisition challenge. The criteria we applied in our assessment, however, represent sound management principles for guiding complex, highly integrated efforts. They reflect DOD's acquisition guidance as well as the Office of Management and Budget's guidance for capital programming across Federal agencies, particularly as it relates to bringing together and synchronizing multiple development efforts. We continue to believe these acquisition management principles serve as a useful, appropriate, and beneficial standard to assess DOD's EPAA acquisition activities. Importantly, these six principles are not just acquisition principles, they reflect general management principles for any major initiative: Identify what you need; identify the players and their roles; put together a plan with timeframes; ensure the pieces of the initiative are organized for success; test your assumptions; and determine how much it's going to cost to see the initiative to completion.

DECISION TIMEFRAME FOR MORE GROUND-BASED INTERCEPTORS

16. Senator NELSON. General O'Reilly, you have indicated that you believe there will be a need for additional GBIs because of the two failed GBI flight tests last year. You stated that you plan to complete two additional flight tests to confirm and

demonstrate that MDA has properly diagnosed and corrected the problem encountered in the most recent flight test failure. The second verification flight test, designated FTG–06b, is not expected to take place until late 2012, which means during fiscal year 2013. You have also stated that after you have studied the results of that second verification flight test, then you will assess the need for any additional number of GBIs, and any additional elements for the test and sustainment plan for the GMD system. During the hearing, you acknowledged that—because the GBI production line will remain open for several years—we have several years to decide how many additional GBIs we might need. Given this plan, is it correct to understand that your assessment and recommendations about additional GBIs would not be completed until sometime during fiscal year 2013, and could be ready for inclusion in the budget request for fiscal year 2014?

General O'REILLY. Successful ground testing of the EKV modifications to resolve the previous flight test issues could be successfully concluded this fall. Based on those results, the PB13 request will reflect whether we propose additional procurement of GBIs at that time. The non-intercept flight test in the winter of 2012 and intercept in summer of 2013 will inform congressional budget deliberations. If these tests are delayed or unsuccessful, Congress will be in an informed position to delay the request for additional GBIs beyond the fiscal year 2013 budget request.

17. Senator NELSON. Dr. Roberts, does this notional schedule fit within our GMD enhancement strategy and plans?

Dr. ROBERTS. Several of the assumptions we used to arrive at a total purchase of 52 GBIs are no longer valid, primarily due to test failures and the need for additional testing. Some increased number of GBIs will be necessary, but we must conclude the investigation of the most recent test failure before we can make a determination about the number of additional GBIs that will be required. Based on the outcome of the investigation, the PB13 request will reflect whether we propose additional procurement of GBIs at that time.

SIGNIFICANCE OF NATO DECISION ON MISSILE DEFENSE

18. Senator NELSON. Dr. Roberts, last November at the Lisbon Summit, the North Atlantic Treaty Organization (NATO) decided to adopt missile defense of NATO Europe as a core mission. As part of this decision, NATO decided to expand its missile defense command and control system, endorsed the U.S. plan for the EPAA to missile defense, and invited Russia to cooperate with NATO on missile defense. Can you tell me your view of the significance of NATO's decision, and how it could benefit security in Europe?

Dr. ROBERTS. I believe the Lisbon decision reflects NATO's determination to remain the world's premier defense alliance by adapting to new challenges. Allies recognized that a new threat to our homelands comes primarily from non-traditional sources such as ballistic missile and WMD proliferation. Therefore, NATO's decision to pursue a territorial missile defense capability is a key step that sends a clear message—NATO is serious about responding to new threats, and is willing and able to pursue critical capabilities to counter those threats.

19. Senator NELSON. Admiral Macy, you are the U.S. military representative to the NATO Air Defense Committee and you have worked closely with NATO on the new missile defense plan. What steps is NATO taking to implement the new plan?

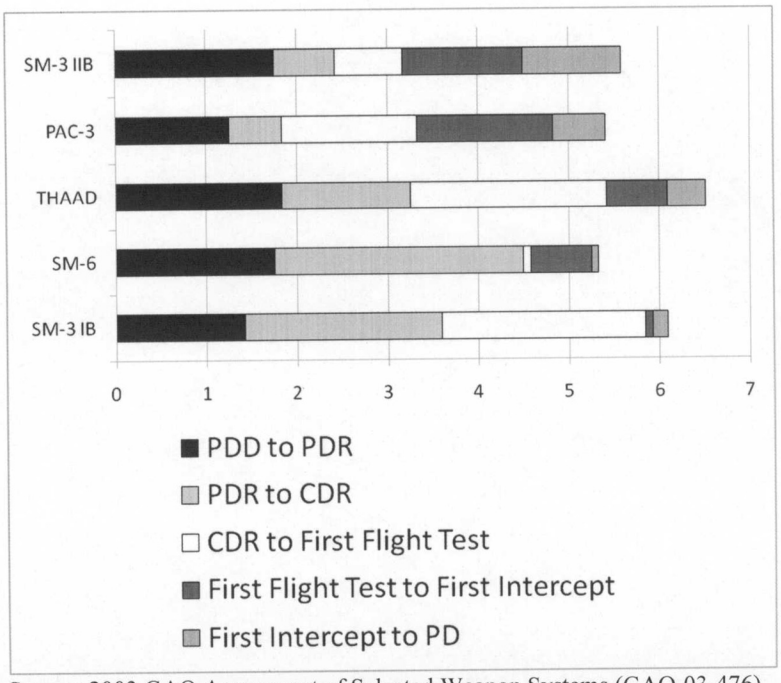
Admiral MACY. NATO is fully engaged in incorporating territorial missile defense of Europe. Per the decisions from the Lisbon Summit, November 2010, NATO has made the decision that missile defense is "its core task of collective defence" and our allies are appreciative of our efforts to include them in our discussions regarding our missile defense concepts and approaches. Now that NATO has made the decision, the BMDS capabilities resident within the EPAA will constitute our national contribution to the mission of collective defense. Implementing the EPAA provides the opportunity for NATO to contribute national systems and participate alongside the United States, and it is a very effective and efficient approach to NATO missile defense that allows all participants to leverage the investment other nations are making. The recent MDA demonstration of the Command, Control, Battle Management, and Communications (C^2BMC) system interfacing with NATO's Active Layered Theater Ballistic Missile Defense (ALTBMD) program is a premier example of this implementation. In addition, NATO has committed to expand the ALTBMD program from beyond the protection of NATO deployed forces to also protect NATO European populations, territory, and forces. Finally, the alliance is increasing its participation in missile defense exercises progressing from simply observing to active

participation in the Nimble Titan 2012 exercise. We will work closely within the alliance to craft the appropriate command and control structure to provide for the effective defense of our forward deployed forces, allies, and our partners from missile threats in the region.

STANDARD MISSILE-3 BLOCK IIB SCHEDULE RISK

20. Senator NELSON. General O'Reilly, DOD plans to deploy a new variant of the Standard Missile-3, the Block IIB, on land in 2020 for Phase 4 of the EPAA to missile defense. This interceptor is intended to defend Europe against medium-, intermediate-, and long-range missiles, and to supplement the GMD system for additional defense of the Homeland against intercontinental ballistic missiles (ICBM) from North Korea or Iran. Your agency awarded contracts in early April to three companies to help define the concept and development plan for the new missile, through the end of 2013. Consequently, there is not even a design yet for this interceptor. In addition, MDA is just starting to develop new technology needed for the missile, and the Aegis BMD program office is not expected to manage the program until 2013. Given these considerations, how confident are you that this new missile will be ready to deploy in 2020, and how will you manage schedule risk?

General O'REILLY. I am confident that we will deploy the SM–3 Block IIB interceptor in the 2020 timeframe to support Phase 4 of EPAA. The SM–3 Block IIB schedule is based on recent government experience developing similar successful missile defense interceptor programs. Product development for SM–3 Block IIB spans 7 years, beginning in third quarter fiscal year 2013 and continuing through initial operational capability (IOC) in 2020. The time between product development and a production decision for this program is 5½ years. This development to production decision timeline is consistent with the average of BMD interceptors including Patriot, THAAD, SM–6, and SM–3 Block IB as reported by GAO (see attached).



Source: 2003 GAO Assessment of Selected Weapon Systems (GAO-03-476)
2010 GAO Assessment of Selected Weapon Systems (GAO-10-388SP)

Concept Definition and Program Planning contracts we recently awarded to three potential SM–3 Block IIB development prime contractors add a broad industry analysis to further inform our schedule projections. Each contractor is conducting missile trade studies to define SM–3 Block IIB concepts, challenges, and program plans for Product Development. For the next 2 years we are executing technology risk reduction efforts to mature key interceptor components that increase performance and potentially reduce cost. Specifically, we are investing now with multiple vendors in kill vehicle divert and attitude control systems, upper stage propulsion, focal plane arrays, and lighter weight structures and materials to reduce inert mass. These investments reduce risk in key technology areas to further minimize our Product Development schedule risk.

GAO VIEW OF AEGIS ASHORE RISK

21. Senator NELSON. Ms. Chaplain, the Aegis Ashore program planned for deployment in Europe is based on the existing Aegis BMD program. As your prepared statement notes, and as the Director of Operational Test and Evaluation has also stated, the Aegis BMD program is the most mature in terms of development and operational suitability. If the Aegis Ashore program is based on the most mature existing Aegis BMD system, can you explain why GAO believes the Aegis Ashore program still has a degree of developmental risk?

Ms. CHAPLAIN. While Aegis Ashore is being developed out of the Aegis BMD program, it is not based on the configuration that has been tested and is deployed today, which is the 3.6.1 Aegis Ballistic Missile Defense System (BMDS) with the Standard Missile 3 Block 1A. The high levels of risk we see are based on the commitment to produce the weapon system before the design is proven through ground and flight testing. This commitment increases the chances for discovering issues with the hardware and software that could lead to costly redesign, rework, and doubts about the performance of the system.

The Aegis Ashore will use the new 4.0.1 and 5.0 systems currently in development, and the new version of the interceptor also in development. Yet MDA has decided to commit to procure the system starting in 2012, well before results of ground and flight testing are available. We have repeatedly found in our reviews of major acquisitions that basing commitments, such as the decision to manufacture systems for operational use, should be based on demonstrated knowledge. One key step before that commitment is demonstrating a production representative system in a realistic environment. That will not occur until 2014 when the test version demonstrates the ability to successfully launch and engage a target. However, in order to meet the schedule that requires the Aegis Ashore to be operational by 2015, manufacture must begin in 2012.

We discuss additional acquisition risks related to Aegis Ashore in Appendix IV of our March 26, 2011 report (GAO–11–372).

IMPACT OF EPAA RADAR ON GMD CAPABILITY

22. Senator NELSON. General O'Reilly, there has been discussion of the importance of a forward-deployed AN/TPY–2 radar in Phase 1 of the EPAA for the defense of Europe. However, that radar would also improve the performance of the GMD system to defend the United States. Can you tell me how that radar would enhance the GMD system, and how significant that improvement would be?

General O'REILLY. [Deleted.]

23. Senator NELSON. Dr. Roberts, would you consider this radar deployment to be an enhancement of the GMD system, even though it is placed in a regional missile defense context?

Dr. ROBERTS. Yes, the deployment of a forward-based radar in southern Europe improves the missile defense protection of both Europe and of the United States.

U.S.-ISRAELI COOPERATIVE PROGRAMS

24. Senator NELSON. General O'Reilly, for the cooperative missile defense programs we are developing jointly with Israel, you have established a joint program management structure including representatives from both nations. Has this joint program management structure worked as you had hoped it would?

General O'REILLY. The joint management structure implemented in the two most recent U.S.-Israeli cooperative Project Agreements (Upper Tier and David's Sling) is working as expected. Older agreements for programs such as the Arrow System

Improvement Program did not specify joint management practices. This created a potential problem where MDA was informed of progress and actions after the fact, and without performance metrics. In the newer agreements, visibility and accountability have increased through the establishment of program baselines, configuration control boards, jointly-defined and approved Knowledge Points, and joint decision authority for major program decisions (e.g., contract issuance, concurrence to proceed with test events, and design review entrance and exit criteria). These practices have all contributed to better U.S. understanding of progress, challenges, and risk to both schedule and resource planning for these programs.

25. Senator NELSON. General O'Reilly, in the past, you expressed concern that the Arrow-3 interceptor being developed jointly by the United States and Israel had high technical and schedule risk. What is your current assessment of the level of technical and schedule risk in the Arrow-3 program, and has the program met its required knowledge points?

General O'REILLY. While significant progress has been achieved in the Arrow-3 development program, I believe that my original assessment of high technical and schedule risk is still valid. Of the 20 Knowledge Points, 6 of 7 planned have been successfully accomplished thus far. One Knowledge Point related to the booster motor was not met due to a static test failure, and the re-design and re-test is in progress. As we have proceeded into more complex component ground tests leading up to the first flight test, additional technical issues have surfaced. These technical issues are driving slight schedule delays (first quarter so far) for the first flight test, but there is very little schedule margin to be able to accommodate any additional issues. The remainder of the schedule through IOC declaration is also success-oriented with no room for error. Execution of the first flight test at the end of this year will be a major program milestone from which additional technical and schedule assessments will be made.

DEVELOPMENT OF SENSOR SYSTEMS

26. Senator NELSON. General O'Reilly, MDA is developing two sensor systems to improve tracking and interception of large numbers of regional missiles. These systems are the Airborne Infrared (ABIR) and the Precision Tracking Space System (PTSS). The ABIR would be an unmanned aerial vehicle, and the PTSS is a satellite system. Can you explain the role of these two systems, and whether you believe they would both be necessary—or if one of them would be sufficient?

General O'REILLY. While the PTSS provides the most cost-effective and assured comprehensive coverage of the Northern Hemisphere, I believe both systems, ABIR and PTSS, are necessary for the success of the BMDS.

PTSS is planned because it offers the advantages of assured access to the greatest regions of threat launch activity and provides persistent tracking coverage of ballistic missiles over their entire flight. Because of Space Tracking and Surveillance System (STSS) demonstrations and our work with the SBIRS community, we believe that the technological basis for satellite-to-shooter engagements is available today. PTSS post-boost and midcourse tracking accuracies are suitable for any of our BMDS interceptors to achieve a high probability engagement over the widest possible geometries. The estimated annual O&M costs of a globally deployed PTSS constellation is $75 million/year.

ABIR is being demonstrated now because of the flexibility that UAV-based systems have to rapidly extend sensor coverage and battle space beyond fixed radar sites outside the PTSS coverage of the Northern Hemisphere, provide early ascent phase tracking, and integrate readily with the existing Service infrastructures and BMDS network. Further, while today's sensors are useful and complementary to the BMDS radars, advanced ABIR sensors will significantly improve tracking accuracies, threat identification, and timeliness of reporting to the regional shooter. The estimated annual O&M cost of an ABIR Combat Air Patrol (CAP) of 3 aircraft is greater than $56 million per CAP. Of note, ABIR will require overflight permission from countries required for viewing access.

Both of these systems promise improvements to the warfighter in earlier and higher confidence threat awareness and ability to address the highest priority ballistic missile threats. Given the actual annual O&M costs to operate an AN/TPY–2 radar of more than $50 million per year per radar and the requirement for Host Nation basing agreements to locate a radar in a region of interest, the PTSS is a critical system for affordable, unrestricted, and responsive missile defense in the future. The PTSS provides persistent broad earth coverage and ABIR provides flexible regional surge capability.

27. Senator NELSON. Admiral Macy, can you give me a military perspective on the importance of these two systems to our future missile defense capability?

Admiral MACY. The ABIR sensor and the PTSS are vital to the future BMDS. Both systems will enhance the combatant commanders' ability to defend against ballistic missiles by increasing their capability and capacity to counter these threats. Any further discussions of the importance of these systems and the contribution that they make must be conducted in a classified setting.

28. Senator NELSON. Admiral Macy, do you view them as both being necessary to the capabilities that the combatant commanders will need?

Admiral MACY. The capabilities of the ABIR system and PTSS will be vital to the combatant commanders' future ability to defend against ballistic missiles. Any further discussions of the importance of these systems and the contribution that they make must be conducted in a classified setting.

QUESTIONS SUBMITTED BY SENATOR JEANNE SHAHEEN

AN/TPY–2 PROGRAM

29. Senator SHAHEEN. General O'Reilly, the forward deployment of AN/TPY–2 radars will be fundamental to the success of the EPAA and will be important in meeting the combatant commands' (COCOM) needs for regional missile defense around the globe. In your written testimony, you note several accomplishments with respect to the AN/TPY–2 program, including the refurbishment of an AN/TPY–2 radar for phase 1 of the EPAA as well as the preparation of a second radar for deployment to U.S. Central Command (CENTCOM). You also note that the fiscal year 2012 budget request includes support for additional AN/TPY–2 radars. Is DOD currently planning for the possibility of a multi-year procurement of the AN/TPY–2 radar and what would be the reasoning behind such a decision?

General O'REILLY. MDA is evaluating the merits of a multi-year production procurement for AN/TPY–2 radars. This strategy reflects DOD's initiative to identify efficiencies that reduce costs of delivering warfighting capability. No decisions have been made at this time due to considerations of obsolescence changes and the need for subsequent testing prior to proposing a multi-year procurement.

30. Senator SHAHEEN. General O'Reilly, would you anticipate cost savings to accrue from a multi-year procurement of the AN/TPY–2 radar?

General O'REILLY. MDA anticipates there would be cost saving from a multi-year procurement. We are evaluating the merits of a multi-year production for AN/TPY–2 radars. This strategy reflects DOD's initiative to identify efficiencies that reduce costs of delivering warfighting capability. No decisions have been made at this time due to considerations of obsolescence changes and the need for subsequent testing prior to proposing a multi-year procurement.

31. Senator SHAHEEN. General O'Reilly, are you confident that the current AN/TPY–2 development plans are adequate to match our COCOM near-term requirements as well as the requirements of the EPAA?

General O'REILLY. MDA remains confident that current AN/TPY–2 capability, increased quantities, and delivery timelines included in the budget will provide the warfighter the capability to address near term emerging threats and the EPAA.

32. Senator SHAHEEN. General O'Reilly, do you anticipate that any of the emerging challenges faced by our COCOMs will require additional development in the near-term?

General O'REILLY. Depending on how and when the challenges emerge, MDA has options for additional near-term development of the AN/TPY–2. We conducted a 2010 summer study to evaluate investment options in response to challenging scenarios. The study concluded that while additional development to the AN/TPY–2 was not expected to be necessary, several investment options could add operational margin to help improve defense against an uncertain threat including dynamic resource management and debris mitigation.

QUESTIONS SUBMITTED BY SENATOR KIRSTEN E. GILLIBRAND

EAST COAST MISSILE DEFENSE DATA TERMINAL

33. Senator GILLIBRAND. General O'Reilly, I appreciated your testimony that an east coast interceptor communication terminal for the GMD system will significantly enhance the security of the United States by improving defense of the east coast against a potential future missile threat from North Korea or Iran. I understand that Fort Drum in New York is under consideration as the site for such a terminal. Can you explain why you are pursuing this new capability and why Fort Drum would be a good site for the data terminal?

General O'REILLY. An east coast interceptor communications terminal improves the ability of the GMD system to defend the east coast of the United States by providing data updates to Ground-Based Interceptors (GBI) launched from Fort Greely, AK, and Vandenberg Air Force Base, CA, later in flight, thus increasing its probability of engagement success. The performance region was determined based upon current projections of the threat capability by 2015 and on the planned BMDS architecture in the same timeframe. Fort Drum, NY, was selected because it is within the required performance region and previous site surveys, environmental assessments, and use permits are already in place.

34. Senator GILLIBRAND. Dr. Roberts, how does this planned east coast missile defense data terminal fit into the planned enhancements you mentioned for the GMD system?

Dr. ROBERTS. An east coast interceptor communications terminal improves the ability of the GMD system to defend the east coast of the United States by providing data updates to GBIs launched from Fort Greely, AK, and Vandenberg Air Force Base, CA, later in flight, thus increasing its probability of engagement success.

35. Senator GILLIBRAND. Admiral Macy, from a military perspective, would this east coast data terminal provide a useful improvement to our Homeland missile defense capability?

Admiral MACY. A data terminal on the east coast would improve our overall defense capability by providing better information to the GBIs in flight. This data terminal will enable communication with GBIs launched from Alaska and California on longer flights that will improve the defense of the eastern United States against potential ICBM threats.

QUESTIONS SUBMITTED BY SENATOR JEFF SESSIONS

FUTURE BUDGET AFFORDABILITY

36. Senator SESSIONS. Ms. Chaplain, it seems quite clear that there will not be enough money in future budgets to cover the costs of the weapon system programs currently underway. In your opinion, is MDA's current portfolio of acquisition programs affordable at the funding level set forth in the President's fiscal year 2012 and Future Years Defense budgets?

Ms. CHAPLAIN. Judgments about affordability need to be made in the context of the overall DOD budget, the Nation's priorities, and reliable cost data. I can only comment on the last point. We have reported that MDA's cost estimates are not yet reliable or credible nor do they meet our criteria for high quality estimates. Our March 2011 report details where cost estimates need to improve and how.

PHASE 1 OF PHASED ADAPTIVE APPROACH

37. Senator SESSIONS. Dr. Roberts, General O'Reilly, and Admiral Macy, what is the current status for deployment of Phase 1 of the PAA to missile defense in Europe?

Dr. ROBERTS and Admiral MACY. The first BMDS element deployment in support of Phase 1 of the EPAA capability occurred on March 7 of this year when the USS *Monterey* (CG 61) deployed to Europe. *Monterey* will spend this spring and summer helping to develop, test, and verify the necessary command and control processes, data pathways, tactics, techniques, and procedures. In addition, the C^2BMC upgrade to the air operations center at Ramstein Air Base, Germany has been installed to control the AN/TPY–2 forward based radar and connect it and any Aegis ships into our command and control structure in Europe. Finally, negotiations are continuing to finalize plans to locate and operate the AN/TPY–2 radar in support of the EPAA.

General O'REILLY. USS *Monterey* CG 61, Aegis BMD 3.61 with SM–3 Block 1A missiles is currently deployed in theater. AN/TPY–2 radar is currently undergoing refurbishment and is on schedule to be available to MDA on August 31, 2011, with a proposed movement date of September 20, 2011. C^2BMC systems are available and scheduled to deploy on August 31, 2011. Current schedule meets test program timelines. A critical EPAA phase 1 milestone was achieved in March 2011 when an IRBM-range target was intercepted in the Pacific by a SM–3 IA interceptor using the current Aegis fire control system and the EPAA forward based AN/TPY–2 and command and control architecture. Finally, negotiations are continuing to finalize plans to locate and operate the AN/TYP–2 radar in support of the EPAA.

38. Senator SESSIONS. Dr. Roberts, General O'Reilly, and Admiral Macy, do you foresee any obstacles for meeting full deployment of Phase 1 by the end of the year?

Dr. ROBERTS. We have already deployed the USS *Monterey* as part of the sea-based missile defenses that are part of Phase 1 of the EPAA.

While I do not see any insurmountable obstacles, there may be challenges to reaching a host-nation agreement and deploying the AN/TPY–2 radar by the end of the year. However we still intend to deploy the radar as part of Phase 1 of the EPAA.

General O'REILLY. We are awaiting host nation agreement to field the AN/TPY–2 in support of Phase 1.

Admiral MACY. In order to achieve full deployment of Phase 1 by the end of the year, a host nation agreement must be achieved to support deployment of the AN/TPY–2 radar. Once this host nation agreement is obtained and deployment preparations begin, we will have better fidelity on when full deployment will actually occur. At this time, there are no obstacles that cannot be overcome, however, full deployment of Phase 1 may be delayed.

39. Senator SESSIONS. Dr. Roberts, General O'Reilly, and Admiral Macy, what is the current status of basing negotiations for the forward-based radar in southern Europe?

Dr. ROBERTS. We are currently in discussions with potential host nations for the deployment of an AN/TPY–2 forward-based radar to southern Europe. No final host-nation decision has been made.

General O'REILLY. MDA provides programmatic and technical support for basing negotiations. Current status of basing negotiations is more authoritatively addressed by OSD(P) and the Department of State.

Admiral MACY. The current status of basing negotiations is best addressed by OSD(P) and the Department of State.

40. Senator SESSIONS. Dr. Roberts, General O'Reilly, and Admiral Macy, in order to consider Phase 1 fully deployed by the end of 2011, when must a basing decision be made for the radar in southern Europe?

Dr. ROBERTS and General O'REILLY. We expect that the deployment of the radar will take several months from the time that a basing decision is made. The actual timeline may vary due to the specific basing agreements and legal arrangements associated with the deployment.

Admiral MACY. While we are already inside the window of the optimal deployment timeline, it is still technically possible to achieve a 2011 deployment given a favorable host nation decision, rapid approval of the necessary legal framework, strong and active host nation support, and selection of a prepared site that requires little to no additional development to accommodate the radar.

EUROPEAN PHASED ADAPTIVE APPROACH TRANSPARENCY AND ACCOUNTABILITY

41. Senator SESSIONS. Dr. Roberts, General O'Reilly, Admiral Macy, and Ms. Chaplain, according to a recent GAO report, "DOD has not fully implemented a management process that synchronizes European Missile Defense acquisition activities and ensures transparency and accountability." Without these key metrics, the ability to conduct effective oversight is greatly impeded. Given that each of the four phases of the PAA are closely tied to concrete timeframes, what tools will be used to ensure that planned capabilities are delivered on time?

Dr. ROBERTS and General O'REILLY. The tools the MDA uses to ensure on time delivery of the PAA planned capabilities include an Integrated Master Schedule (IMS), the BMDS Specification, the Integrated Master Test Plan (IMTP), the MDA budget, and the program baselines from the contributing BMDS component programs.

BMDS component programs use six baselines for each system element being developed. These include a Technical Baseline, Operational Capacity Baseline, Test Baseline, Schedule Baseline, Resource Baseline, and Contracts Baseline. Critical milestones are captured in each, and specifically in the schedule and technical baselines including key events such as planned capability delivery in support of the EPAA.

The MDA Baseline Execution Review (BER), Technology Baseline Review (TBR), and Development Baseline Review (DBR) are the tools used to ensure that planned capabilities are being developed and delivered on time. These baselines are reviewed monthly to monitor program performance and ensure alignment with the schedule for delivering the PAA. The MDA Director conducts quarterly BERs. MDA annually provides the BMDS Accountability Report (BAR) to Congress which contains detailed information on all of the baselines for each MDA program.

Admiral MACY. As the programmatic and technical lead for acquisition and development in support of the EPAA, the tools necessary to deliver these planned capabilities on time is more authoritatively addressed by MDA.

Ms. CHAPLAIN. Given the extent of acquisition activity associated with implementing the EPAA, GAO believes that the following basic acquisition management tools and principles should be used to ensure that the EPAA effort can be successfully implemented. We found MDA had partially adopted these principles as described below.

- Well-defined requirements - DOD and MDA continue to define architectures, systems, and quantities needed to accomplish the missile defense mission set across the four phases. We have reported over the years that stable requirements are necessary to fully understand and plan for successive steps in the acquisition process, such as development and testing. As the series of acquisitions supporting the EPAA proceeds, we believe a clear business case is important to inform tradeoffs leadership may have to accept among cost, schedule, and performance to deliver capability within desired EPAA phase timeframes.
- Stakeholders and decisionmakers identified and roles defined - DOD and MDA's acquisition management and oversight process is structured around reviewing and approving activities of individual missile defense elements through a phased decision process. It remains unclear whether, how, and which various bodies reviewing MDA acquisitions are specifically reviewing the overall progress in acquiring integrated capability for EPAA phases within the timeframes called for by that approach. We continue to believe top level reviews of EPAA acquisitions would be useful.
- Integrated schedule and decision reviews - DOD and MDA manage and oversee MDA acquisitions through several mechanisms including the Missile Defense Executive Board (MDEB) and its associated subcommittees. It remains unclear whether the MDEB has a management or oversight role in acquisition decisionmaking related to EPAA specifically.
- Integrated planning for technology development and system engineering - MDA's planning efforts for development and system engineering reflect the interdependencies of the BMDS elements and the integrated performance expected under the EPAA. Executing these development plans remains challenging under the EPAA deployment schedule.
- Integrated testing - MDA's test plan is structured around the PAA, and includes plans to test key capabilities expected as part of EPAA. The twice-yearly process of updating the test plan facilitates the participation of a wide variety of stakeholders in MDA's testing approach; however while the test plan itself is sound, we continue to have concerns about the plan's executability. MDA's practice of eliminating or deferring important developmental and operational tests limits knowledge available for management decisions.
- Integrated view of financial commitment - We continue to believe that a life cycle cost estimate for the subset of capabilities to be deployed as part of EPAA would help to ensure that DOD's investment decisions are fully informed.

42. Senator SESSIONS. Dr. Roberts, General O'Reilly, Admiral Macy, and Ms. Chaplain, has MDA developed a life-cycle cost estimate for the EPAA?

Dr. ROBERTS. The EPAA is a capability deployment approach and not an acquisition program, and therefore it does not have a life cycle cost estimate. EPAA is the phased deployment of individual BMDS capabilities as those capabilities are developed, tested, produced, and deployed within the BMDS architecture. MDA produces life cycle cost estimates for the individual BMDS acquisition programs that comprise

the EPAA and other deployments globally. MDA can provide the cumulative deployment costs of the EPAA and the lifecycle costs of the individual elements that comprise the Joint Staff deployment plans of each COCOM. Due to its adaptive nature, no fixed inventory can be established for EPAA due to the possibility that differing regional security environments may require the surging of missile defense capabilities into other regions.

General O'REILLY. EPAA itself is a capability deployment approach and not an acquisition program, and therefore it does not have a life cycle cost estimate. EPAA is the phased deployment of individual BMDS capabilities as those capabilities are developed, tested, produced and deployed within the BMDS architecture. MDA produces life cycle cost estimates for the individual BMDS acquisition programs that comprise the EPAA and other deployments globally. We can provide the cumulative deployment costs of the EPAA and the lifecycle costs of the individual elements that comprise the Joint Staff deployment plans of each COCOM. Due to its adaptive nature, no fixed inventory is established for EPAA vice the simultaneous deployment needs of other COCOMs.

Admiral MACY. The EPAA is not a system for which a single life-cycle cost estimate can be developed. Rather, the EPAA is a framework that provides an adaptable strategy for missile defense in Europe. While some components within this framework possess life-cycle costs that can be readily attributable to EPAA (e.g., Aegis Ashore), many of the components that have dual or multi-use purposes (e.g., Aegis ships) cannot.

Ms. CHAPLAIN. MDA has not developed a life-cycle cost estimate for the EPAA. While MDA did produce an informal estimate in the fall of 2009, it does not reflect the current EPAA architecture. As we reported in January 2011, DOD has not developed and does not plan on developing EPAA life-cycle cost estimates because it considers EPAA an adaptive approach that will change over time. However, best practices for cost estimating include methods for developing valid cost estimates even with such uncertainties. These estimates could serve as a basis for DOD and Congress to assess the goal of fielding affordable and cost-effective BMDs as well as determine if corrective actions are needed. We therefore recommended in January 2011 that DOD develop a life-cycle cost estimate for EPAA.

43. Senator SESSIONS. Dr. Roberts, General O'Reilly, Admiral Macy, and Ms. Chaplain, now that the Joint Staff has completed its Joint Capabilities Mix III (JCM III) study, shouldn't MDA have a better understanding of the total costs associated with the deployment of the architecture envisioned for Europe?

Dr. ROBERTS. The JCM III results are a useful component for developing the total costs associated with the deployment of the architecture envisioned for Europe. However, the study did not include deployment costs in its assessments.

While the results of the JCM III are not sufficient for MDA to establish the total cost of the architecture envisioned for Europe, its findings will be helpful as we determine future missile defense needs.

General O'REILLY. MDA considers the JCM III results as a useful component of our developing the total costs associated with the deployment of the architecture envisioned for Europe. However, the study did not include deployment costs in its assessments. Furthermore, the radar location in Europe that JCM III assumes may still change due to political considerations. Any changes in radar basing would impact the number and deployment costs of interceptors as well as the deployment costs of the radars themselves.

The JCM III study shows the capability of the currently funded PAA against intel-based threats, and analyzes improvements that could be achieved with increased resources. The study made a number of assumptions about system track correlation and weapons system deconfliction, hit assessment, and C^2BMC capability that are still under development. In addition, the study did not factor in the platform costs of fielding the number of ABIR systems employed in their analysis.

While the results of the JCM III are not sufficient for MDA to establish the total cost of the architecture envisioned for Europe, we will support the study as it moves to the next phase and incorporate its findings into our cost estimation.

Admiral MACY. The JCM III study was a qualitative performance analysis to determine the warfighters' requirements for elements of the BMD System required for BMD. This study focused on warfighting sufficiency rather than inventory acquisition objectives by examining the application of architectures to deter aggressors and end enemy ballistic missile attacks should they occur. JCM III did not attempt to simply answer how much to buy, but rather give alternatives to the warfighter to best achieve their overall goals. As such, JCM III provides utility to senior leaders on resourcing and allocation decisions, not total costs.

Ms. CHAPLAIN. DOD should have a better understanding of the total costs associated of EPAA after completion of JCM III. DOD has not briefed GAO on the study. Given that DOD, led by the Joint Staff, has used the JCM III study to examine all elements of the regional BMDS, to examine the performance against threat ballistic missiles that employed a range of countermeasures, and to identify alternatives that the warfighter can employ to best achieve his overall goals, the results of the study should yield additional information needed to better understand costs associated with each phase of the EPAA. As we reported in January 2011, the Joint Staff-led JCM III along with a U.S. Strategic Command study should help to better define force allocation and quantity needs for PAA in Europe and other regions. It is clear, however, that DOD faces a management and operational challenge since there is greater demand for missile defense assets than there will be a supply of those assets.

Best practices for cost estimating include methods for developing valid cost estimates even with the uncertainties associated with EPAA architectures. These estimates could serve as a basis for DOD and Congress to assess the goal of fielding affordable and cost-effective BMDs as well as determine if corrective actions are needed. However, we reported in January 2011 that DOD needs to determine whether the EPAA schedule is realistic and achievable, to identify potential problems, and to analyze how changes will affect the execution of this effort.

SM–3 BLOCK IIB

44. Senator SESSIONS. General O'Reilly, as I mentioned in my opening statement, I am concerned that the schedule for development and deployment of the SM–3 IIB is overly optimistic. How confident are you that the SM–3 IIB will be delivered by 2020 for Phase 4 of the PAA?

General O'REILLY. I am confident that we will deploy the SM–3 Block IIB interceptor in the 2020 timeframe to support Phase 4 of EPAA. The SM–3 Block IIB schedule is based on recent government experience developing similar successful missile defense interceptor programs. Product development for SM–3 Block IIB spans 7 years, beginning in third quarter fiscal year 2013 and continuing through IOC in 2020. Within that interval, 5½ years is projected between the product development and production decisions. This time allocation is consistent with the average of typical BMD interceptors including Patriot, THAAD, SM–6, and SM–3 Block IB as reported by the GAO.

Concept Definition and Program Planning contracts we recently awarded to three potential SM–3 Block IIB development prime contractors add a broad industry analysis to further inform our schedule projections. Each contractor is conducting missile trade studies to define SM–3 Block IIB concepts, challenges, and program plans for Product Development. For the next 2 years we are executing technology risk reduction efforts to mature key interceptor components that increase performance and potentially reduce cost. Specifically, we are investing now with multiple vendors in kill vehicle divert and attitude control systems, upper stage propulsion, focal plane arrays, and lighter weight structures and materials to reduce inert mass. These investments reduce risk in key technology areas to further minimize our product development schedule risk.

45. Senator SESSIONS. General O'Reilly, what is the anticipated SM–3 IIB capability against ICBMs from Iran?

General O'REILLY. [Deleted.]

46. Senator SESSIONS. General O'Reilly, do you agree with the Aegis weapons system development philosophy of incremental development, refinement, and proven design? If so, why did you decide to not involve the Aegis program office in early SM–3 IIB development efforts?

General O'REILLY. The MDA fully supports a development philosophy of incremental development, refinement, and proven design. The Aegis program office has been involved with the SM–3 Block IIB program. The SM–3 Block IIB program office employs 12 full-time Aegis BMD personnel to support Aegis Weapon System integration and program planning activities. Following the proven technology approach of the current family of SM–3 interceptors, the program currently falls under the leadership of the MDA Program Executive for Advanced Technology because the Block IIB is currently in the Technology Development Phase. As in our Navy/BMDO Terrier Lightweight Exo-Atmospheric Projectile (LEAP) technology demonstration program which developed the technical concepts used in today's SM–3 family of interceptors under the management of our Technology Directorate, we will prove the

fundamental kill vehicle and booster technology was ready for product development. As with the original LEAP program, the SM–3 IIB program takes advantage of MDA's advanced technology efforts to develop new concepts in propulsion, lightweight materials, and sensors to reduce the risk associated with achieving the velocity and divert capabilities necessary for the SM–3 Block IIB. After these concepts and technology mature over the next 2 years, the program will then shift to product development and will transition under full Aegis BMD Program Office management in fiscal year 2013.

MDA OVERSIGHT BY CONGRESS

47. Senator SESSIONS. General O'Reilly, responses to requests for information from MDA have never been slower. Countless requests from both personal offices and committee staff take weeks and in many instances months for responses. Are you aware of this? If so, how do you intend to ensure that requests from Congress are responded to in a timely manner?

General O'REILLY. My Deputy Director and I personally review all responses to congressional questions. To respond effectively to congressional inquiries, MDA coordinates closely with the Services, the combatant commanders, and the Office of the Secretary of Defense (AT&L, Policy, and the Comptroller) to ensure our answers are accurate, consistent with DOD objectives, and our programs are executable. This past year has been more challenging due to uncertainty of fiscal year 2011 funding.

However, I fully concur that MDA should respond more rapidly to congressional inquiries. I recently completed a congressional response process review with my senior executive staff. As a result, we have improved our internal processes for responding to congressional inquiries by elevating questions to the attention of our senior executive leaders and increasing visibility of the staffing process within our command group.

48. Senator SESSIONS. Ms. Chaplain, I understand that GAO has had issues with MDA transparency and timely responses to requests for information. Is this true? If so, have you requested that MDA improve access to information necessary for conducting effective oversight?

Ms. CHAPLAIN. GAO has experienced issues with MDA's timely responses to our requests for information. We reported in 2010 that we experienced significant delays in obtaining information from MDA. During that audit, MDA did not always provide GAO staff with expeditious access to requested documents and articles of information, which delayed some audit analysis and contributed to extra staff hours. We reported in 2011 that we again experienced significant delays in obtaining information from MDA. In early 2011, MDA's Director agreed to meet with GAO in an effort to improve our access to data and our working relationship. These efforts have produced new guidance on access which has been signed by both MDA and GAO and we are currently beginning to implement the guidance as we begin our new missile defense-related engagements. We see the guidance as a positive step forward, although it is too soon yet to see significant outcomes from its implementation. Improved access to information will be vital to ensuring we are in a position to assist Congress as it oversees MDA's missile defense efforts.

PRECISION TRACKING SPACE SYSTEM

49. Senator SESSIONS. General O'Reilly, this committee is painfully aware of the troubles associated with space system acquisition. What is your acquisition strategy for the PTSS and why do you feel you are better suited than Air Force Space Command to execute this strategy?

General O'REILLY. PTSS is to be developed as an integrated part of the BMDS. This will require extensive participation of all BMDS elements as the preliminary design is developed. While the Air Force Space Command is a critical partner in the PTSS development, the PTSS development phase must also have involvement of Federally Funded Research Laboratories (Johns Hopkins Applied Physics Laboratory, MIT Lincoln Laboratory, Naval Research Laboratory, Space Dynamics Laboratory, and Sandia National Laboratory); dedicated Service Cells of the Air Force and Navy; and an industry-partnered Integrated System Engineering Team (Ball Aerospace, Boeing, Lockheed Martin, Northrop Grumman, Orbital Sciences, and Raytheon). These PTSS stakeholders will develop non-proprietary, government-owned intellectual property to enable full and open competition for industry to produce the PTSS. FFRCs are well-suited to perform this technical management role for MDA and Air Force Space Command.

MDA's charter is to develop and test all missile defense capabilities, including but not limited to missiles and radars. The development of space-based remote sensing, and the integration of the data into BMD fire-control loops, are integral to the MDA's development of early intercept capability. MDA is better able to lead the systems engineering and testing between the BMDS elements, including PTSS, prior to making production decisions. To support this strategy, the MDA and the Air Force Space and Missile Systems Center agree to assign Air Force personnel to the MDA's programs (included the PTSS program).

50. Senator SESSIONS. Ms. Chaplain, DOD space programs are a part of your GAO portfolio. Do you have any concerns with MDA's acquisition of space systems?

Ms. CHAPLAIN. Our concerns about space acquisitions extend across DOD. As I recently testified before this subcommittee, despite the significant investment in space, the majority of large-scale acquisition programs in DOD's space portfolio have experienced problems during the past two decades that have driven up costs by hundreds of millions and even billions of dollars, stretched schedules by years, and increased technical risks. To address the cost increases, DOD altered its acquisitions by reducing the number of satellites it intended to buy, reducing the capabilities of the satellites, or terminating major space system acquisitions. Moreover, along with the cost increases, many space acquisitions have experienced significant schedule delays—of as much as 9 years—resulting in potential capability gaps in areas such as missile warning, military communications, and weather monitoring. These problems have been evident in Air Force, Navy, and MDA space programs. However, as I testified, the Air Force and the Office of the Secretary of Defense have taken a wide range of actions to prevent them from occurring in new programs.

We have not performed an in-depth review of the PTSS in particular nor of MDA's broader capability to acquire space systems. An assessment of MDA's capability to acquire space systems may be worthwhile given the broader concerns we have identified of a shortage of space acquisition expertise within DOD.

Further, an in-depth review of PTSS may also be worthwhile given issues we highlighted in our March 2011 report. As we reported in March, we have concerns regarding the PTSS program's optimistic schedule. MDA has developed an optimistic PTSS acquisition approach to field an operational constellation by fiscal year 2018. The agency plans to conduct prototyping efforts beginning in fiscal year 2011 and launch two prototype satellites in fiscal year 2015. MDA also plans to launch a minimum of seven additional satellites by fiscal year 2018. We are concerned about this compressed schedule because it took MDA about 8 years to refurbish and develop its predecessor—the two demonstration STSS satellites—which launched in 2009 and took almost 15 months after launch to reach full operational capability. PTSS intends to develop and launch two prototype satellites in approximately 5 years and subsequently launch seven operational satellites in approximately 3 years.

We also reported that delays in fielding a PTSS constellation in fiscal year 2018 would significantly affect the implementation of the PAA to defend Europe and the United States against regional ballistic missile attacks. MDA discovered that there were sensor coverage gaps in its ability to acquire and track large ballistic missile raid sizes, intercept ballistic missiles earlier in their trajectories, assess intercept attempts in real time, and launch additional interceptors, if necessary. Currently, the sensor systems of the BMDS consist of radar sensors, such as SBX and AN/TPY–2. According to MDA, infrared satellites such as PTSS would have advantages over terrestrial radars because they can limit the affect of weather conditions, eliminate the need for host nation agreements, and observe ballistic missile launches occurring in remote locations. In addition PTSS is being designed to track large missile raid sizes soon after launch to enable earlier intercepts. Such capabilities would alleviate sensor coverage gaps and reduce the need for terrestrial sensors.

ACQUISITION REFORMS

51. Senator SESSIONS. General O'Reilly, 1 of the 23 principal actions outlined in Dr. Carter's September 2010 Better Buying Power memo was mandating affordability as a requirement for new weapon programs. How is MDA determining what is affordable?

General O'REILLY. The MDA performs government cost estimates on all BMDS component programs to create a basis for affordability reviews. BMDS component programs that require an Under Secretary of Defense (Acquisition, Technology, and Logistics) production decision typically have an Office of the Secretary of Defense (Cost Assessment and Program Evaluation) Independent Cost Estimate conducted

to support the decision. All BMDS component programs are reviewed by a MDA Director-level program change board to prioritize activities within the BMDS and within individual BMDS component programs. Affordability initiatives from the program manager, program executive staff, and functional staff are applied at this time. These reviews form the basis for the overarching MDA budget request and ultimately determine what each of the BMDS component programs are provided to execute their programs.

52. Senator SESSIONS. General O'Reilly, how will programs be held accountable for meeting affordability targets?

General O'REILLY. BMDS component programs are reviewed quarterly at the MDA Director-chaired BERs. BERs review all six baselines to include the Resources Baseline (the Resource Baseline includes cost and affordability). Any changes to baselines must be approved by the program manager, program executive, and functional manager responsible for the baseline to ensure integration with other BMDS component programs and other baselines. The program manager must account for any variations from the baselines, and significant variations are reported to Congress in the annual BAR.

53. Senator SESSIONS. General O'Reilly, will affordability targets be reported to Congress in the BAR?

General O'REILLY. Yes.

ISRAELI PROGRAMS

54. Senator SESSIONS. General O'Reilly, the fiscal year 2012 budget included a $5 million efficiencies-related reduction for Israeli missile defense cooperative programs. I understand that this reduction is below the funding level agreed to by the United States and Israel. Is that correct?

General O'REILLY. The agreement allows for each partner to execute in accordance with its own national laws and regulations, and those obligations are subject to availability of funds. Thus, the agreement allowed for U.S. efficiency directives to be implemented on our Israeli cooperative programs. $5.0 million in savings was identified in U.S.-Israel Cooperative Programs in fiscal year 2012 through a refined test approach. For example, the completion of U.S.-based flight testing in 2011 (Caravan-2), and the decision to move additional planned flight testing (Caravan-3) to Israel, reduced U.S. test planning and personnel requirements in fiscal year 2012. Thus, the original objectives and scope of U.S. contribution to these Israeli programs will be met.

TWO-STAGE GROUND-BASED INTERCEPTOR

55. Senator SESSIONS. Dr. Roberts and General O'Reilly, while the two-stage GBI has been designated as a contingency in the event development of the IIB takes longer than anticipated, I remain concerned that DOD has yet to identify a serious hedging strategy for testing and potential deployment. If it is determined that the SM–3 IIB will not be technologically feasible in time for a 2020 deployment, how much time would be needed to deploy the two-stage GBIs in its place?

Dr. ROBERTS. The hedge strategy is in the process of being developed and refined. We have committed to brief this committee on the results once it has been approved by the Secretary of Defense. The hedge strategy will include a discussion of hedge options to mitigate the effect of a delay to the SM–3 IIB interceptor.

General O'REILLY. The hedge strategy is under development and will be briefed to Congress by the Office of the Secretary of Defense once it has been approved by the Secretary of Defense. Hedge strategy decision timeline triggers include both the threat assessment and SM–3 IIB developmental progress. The hedge strategy will include timelines for deployment.

56. Senator SESSIONS. Dr. Roberts and General O'Reilly, has the administration outlined a plan that ties two-stage GBI procurement and basing agreements with the schedule and technological milestones for the SM–3 IIB?

Dr. ROBERTS. DOD is reviewing its hedge strategy, including ensuring a sufficient hedge to a potential delay to the SM–3 IIB interceptor. DOD is committed to briefing Congress as soon as the Secretary has approved the hedging strategy.

General O'REILLY. As Dr. Roberts stated in his testimony, DOD is reviewing what more needs to be done to ensure the hedge posture is sufficient to address the pos-

sible threat developments in the timeframe before 2020. DOD is committed to briefing Congress as soon as the Secretary has approved the hedging strategy.

57. Senator SESSIONS. Dr. Roberts and General O'Reilly, how will delaying the test for the two-stage GBI next year to pay for corrective measures related to the two recent three-stage GBI test failures impact the availability of the two-stage as a hedge to the SM–3 IIA and IIB?

Dr. ROBERTS and General O'REILLY. The repeat of FTG–06a will consume a majority of the resources previously estimated for funding FTG–08 (the first intercept test of a two stage GBI). There are two remaining two-stage flight tests necessary prior to a two-stage GBI deployment decision, FTG–08 and FTG–17. FTG–08 has been delayed by 2 years from the second quarter of fiscal year 2012 until the fourth quarter of fiscal year 2014. FTG–17, with upgraded avionics, is delayed from the third quarter of fiscal year 2016 to the fourth quarter of fiscal year 2019. However, we could accelerate flight testing if it is deemed necessary.

The repeat of FTG–06a will consume a majority of the resources previously estimated for funding FTG–08 (the first intercept test of a two stage GBI). There are two remaining two-stage flight tests necessary prior to a two-stage GBI deployment decision, FTG–08 and FTG–17. FTG–08 has been delayed by 2 years from the second quarter of fiscal year 2012 until the fourth quarter of fiscal year 2014. FTG–17, with upgraded avionics, is delayed from the third quarter of fiscal year 2016 to the fourth quarter of fiscal year 2019. If a threat change was to dictate an earlier need, we could accelerate flight testing to accommodate.

[Whereupon, at 4:23 p.m., the subcommittee adjourned.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 2012 AND THE FUTURE YEARS DEFENSE PROGRAM

WEDNESDAY, MAY 11, 2011

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

MILITARY SPACE PROGRAMS

The subcommittee met, pursuant to notice, at 2:04 p.m. in room SD–106, Dirksen Senate Office Building, Senator E. Benjamin Nelson (chairman of the subcommittee) presiding.

Committee members present: Senators Nelson and Sessions.

Committee staff member present: Leah C. Brewer, nominations and hearings clerk.

Majority staff member present: Madelyn R. Creedon, counsel.

Minority staff members present: Daniel A. Lerner, professional staff member; and Michael J. Sistak, research assistant.

Staff assistants present: Christine G. Lang, Hannah I. Lloyd, and Brian F. Sebold.

Committee members' assistant present: Ann Premer, assistant to Senator Ben Nelson.

OPENING STATEMENT OF SENATOR E. BENJAMIN NELSON, CHAIRMAN

Senator NELSON. I call this hearing to order. My good friend, Ranking Member Senator Sessions, is on his way, but they've suggested we go ahead and start, given the fact that we're interrupted by a vote and the White House.

I'd like to welcome all of you this afternoon and our many witnesses. Today we meet to discuss military space programs. Often there is little appreciation or understanding either in the Senate or in the general public of the advantages that space systems provide the U.S. military, the Intelligence Community (IC), and our economy in general. Somehow a satellite flying over a football game just isn't the same as a flyover by a B–2. It just hasn't gotten there yet.

We as a Nation would be greatly diminished without our space assets. Thank you for your commitment and dedication to space and I look forward to a good discussion today.

Our witnesses this afternoon are: Ambassador Gregory L. Schulte—we welcome you to your new position, Deputy Assistant Secretary of Defense for Space Policy; Dr. John A. Zangardi, Deputy Assistant Secretary of the Navy for Command, Control, Communications, Computers, Intelligence, Information Operations, and Space. Is there anything left? [Laughter.]

Dr. ZANGARDI. No, sir, there is not. [Laughter.]

Senator NELSON. All right.

General William L. Shelton, USAF, Commander, Air Force Space Command (AFSPC), we welcome you. Lieutenant General Susan J. Helms, USAF, Commander, AFSPC, Strategic Command, Joint Functional Component Commander for Space (JFCC Space); Lieutenant General Richard P. Formica, USA, Commander, U.S. Army Space and Missile Defense Command/Army Forces Strategic Command (ASMDC/ARSTRAT); Rear Admiral David W. Titley, USN, Oceanographer and Navigator of the Navy and Director, Maritime Domain Awareness and Space; Major General John E. Hyten, USAF, Director, Space Programs, Office of the Assistant Secretary of the Air Force for Acquisition; and Ms. Cristina T. Chaplain, Director, Acquisition and Sourcing Management, Government Accountability Office (GAO).

First, congratulations, as I said, are in order for the successful launch of the Space-Based Infrared System (SBIRS) GEO–1 last Saturday. This satellite is years behind schedule and substantially over budget, but it's finally in orbit.

General Shelton, this is your first opportunity to testify before the subcommittee since your confirmation as the new Commander of AFSPC. Welcome.

I'd also like to note that we have included Lieutenant General Formica in our hearing today representing the Army's small but growing interest in space. General Formica may not think it's small, but by comparison some others do. We've not had the Army testify on space issues in many years and we look forward to hearing from you today.

Finally, Lieutenant General Helms, congratulations on your induction last week to the Astronaut Hall of Fame.

This past year has been a very active one in the space community. The first Advanced Extremely High Frequency (AEHF) satellite was launched in August, although as a result of a failure in the satellite propulsion system it is not yet in its proper orbit. We would appreciate any update on the satellite's progress. As I understand it, AEHF–1 is supposed to be in the right orbit by later this summer.

The first Global Positioning System (GPS)–3F satellite launched just after our hearing last year and the second one should launch later this year, this summer even. The first Space-Based Space Surveillance (SBSS) satellite launched in September. Operational Response Satellite 1 (ORS–1) should launch in June and TacSat–4 will also launch later this summer. Both of these satellites are awaiting resolution of a launch vehicle issue. Of course, the SBIRS launched last week. Quite a year of firsts.

As we all know so well, the Air Force and Navy have struggled for many years with their satellite programs and, while it appears that the many design, development, and manufacturing issues are

mostly resolved, it's been a long and expensive process. The question we have is, what are the lessons learned that can be applied to future programs?

One satellite program is not out of the woods, however, and that is the Defense Weather Satellite System (DWSS), the successor to National Polar-orbiting Operational Environmental Satellite System (NPOESS). Even though the NPOESS program was cancelled a year ago, the acquisition plan for the much-needed DWSS is not finished. We'd like to know the schedule for this program and when there will be an acquisition decision.

While the Navy appears to have solved the technical problems with the antenna on the Mobile User Objective Satellite (MUOS), a communications satellite which just last year was about 11 months late, with a launch date of September of this year. I now understand that MUOS is approximately 21 months late and will not even be delivered until mid-next year. In the mean time, the Navy just put the fifth satellite on contract. We'll be anxious to hear, learn, and discuss more about this delay as well.

The Air Force has two proposals on the table this year. One is to look at block buys of satellites starting with AEHF satellites 5 and 6. The second proposal is to look into a commitment to buy at least eight booster cores per year for the Evolved Expendable Launch Vehicle (EELV). This would entail a much-needed restructuring of the EELV contract and a better understanding of the actual launch costs. We look forward to a thorough discussion of the very successful, but expensive, EELVs.

The final issue is the space industrial base. From rocket motors and engines to the smallest satellite parts, the supply base is getting smaller. We'd like to hear your thoughts on how to strengthen this industrial base.

We have a large panel today, so I will conclude and ask Senator Sessions for his comments. What I'm hopeful is that our panelists know that we have to leave at 3:20 p.m., we have a vote at 3 p.m., and for a late-breaking meeting to the White House. You've submitted prepared statements, they will be included in the record. If we could maximize the time and, very briefly, identify your highest priority in about 2 minutes.

Ambassador Schulte, we'll begin with you. Then Zangardi, Shelton, Helms, Formica, Titley, Hyten, and Chaplain. Thank you. Ambassador.

STATEMENT OF HON. GREGORY L. SCHULTE, DEPUTY ASSISTANT SECRETARY OF DEFENSE FOR SPACE POLICY

Ambassador SCHULTE. Mr. Chairman, thank you for the opportunity to testify this afternoon. In February, Secretary Gates and Director of National Intelligence Clapper submitted to Congress a first-ever National Security Space Strategy (NSSS). This new strategy starts with dramatic changes in space, a domain that remains vital to our national security, but that is increasingly congested, contested, and competitive.

In the face of these challenges, this new strategy seeks to protect the strategic advantages that we derive from space while also protecting the domain itself and the industrial base that is so important to our capabilities there. My prepared statement summarizes

the strategy. I would like to focus briefly on three important aspects: first, promoting responsible use of space; second, partnering with other countries; and third, deterring attacks on our space systems.

Promoting the responsible use of space is one of the new strategy's key approaches. A more cooperative, predictable environment enhances our national security and discourages destabilizing behavior. The United States is leading by example. We are preparing to begin providing pre-launch notifications of our space launches, just as we have notified ballistic missile launches in the past.

U.S. Strategic Command (STRATCOM) has signed agreements with some 23 satellite operators across the world to share data and warnings of possible collisions. The United States is also looking to promote international transparency and confidence-building measures for space. With that in mind, we are currently evaluating the European Union's (EU) proposed International Code of Conduct for Outer Space Activities. Our preliminary review suggests that such a code could provide a positive approach to promoting responsible space—responsible behavior, but the administration has not yet made a final determination on the code or changes that would be necessary for us to accept it, and the Department of Defense (DOD) is assessing its operational impact.

Partnering with other countries is another key approach of the new strategy. Partnerships allow us to benefit from the growing space capabilities of allies and other countries, to make our space systems more diverse and resilient, and to improve our ability to operate in coalition. As an important step in that process, we are looking at transitioning STRATCOM's Joint Space Operations Center (JSpOC) into a combined space operations center with allies.

Another good example of partnership is the Wide-Band Global satellite communications (SATCOM). Australia has bought into the constellation and the Air Force is negotiating with other allies to also buy in. This expands the number of satellites, adds coverage and resiliency, and shares the cost, a welcome benefit at a time of budget constraints.

The new strategy also reflects a new multi-layered approach to deterring attacks on our space systems, which is important as space becomes increasingly contested. The first layer of deterrence is the establishment of norms of responsible behavior, as I discussed. The second layer of deterrence is the establishment of international coalitions so that an attack on the capability of one becomes the attack on the capability of many.

The third layer of deterrence is increasing our resilience and capacity to operate in a degraded environment. The fourth layer of deterrence is a readiness and capability to respond in self-defense and not necessarily in space.

In conclusion, Mr. Chairman, DOD has adopted a new space strategy to protect the national security advantages that we derive from a domain that is increasingly congested, contested, and competitive, and we look forward to working with you and Congress in implementing this strategy.

Thank you.

[The prepared statement of Ambassador Schulte follows:]

PREPARED STATEMENT BY AMBASSADOR GREGORY L. SCHULTE

Chairman Nelson, Ranking Member Sessions, and members of the subcommittee, thank you for the opportunity to testify on Department of Defense (DOD) space policy. I am honored to join my distinguished colleagues from the Army, Navy, Air Force and the Government Accountability Office (GAO). Today, I am pleased to discuss the recently released National Security Space Strategy (NSSS).

Maintaining the benefits afforded to the United States by space is central to our national security. Space systems allow our warfighters to see with clarity, communicate with certainty, navigate with accuracy, and operate with assurance. However, an evolving strategic environment increasingly challenges U.S. space advantages. The current and future strategic environment is driven by three trends—space is increasingly congested, contested, and competitive.

Space is increasingly congested. Growing global space activity and testing of China's destructive anti-satellite system have increased congestion in important areas in space. DOD tracks approximately 22,000 manmade objects in orbit, of which 1,100 are active satellites. Another area of increasing congestion is the radiofrequency spectrum. As many as 9,000 satellite communications transponders are expected to be in orbit by 2015. As more transponders are placed in service, the greater the probability of radiofrequency interference. This congestion is complicating space operations for all those that seek to benefit from space.

Space is increasingly contested in all orbits. Potential adversaries are seeking to exploit perceived space vulnerabilities through a range of counterspace threats that may deny, degrade, deceive, disrupt, or destroy space assets and supporting infrastructure from widely available jamming technology to highly-sophisticated, kinetic anti-satellite weapons. As more nations and non-state actors develop counterspace capabilities over the next decade, threats to U.S. space systems and challenges to the stability and security of the space environment will increase. Irresponsible acts against space systems could have implications beyond the space domain, disrupting worldwide services upon which the civil and commercial sectors depend.

Space is increasingly competitive. More than 60 nations and government consortia currently operate satellites. Although the United States maintains an overall edge in space capabilities, the U.S. competitive advantage has decreased as market-entry barriers have lowered. Some U.S. suppliers are at risk due to inconsistent acquisition and production rates, long development cycles, and a more competitive foreign market. A decrease in specialized suppliers further challenges U.S. abilities to maintain assured access to critical technologies, avoid critical dependencies, inspire innovation, and maintain leadership advantages. All of these issues are compounded by challenges in recruiting, developing, and retaining a technical workforce.

However, the challenges of a congested, contested, competitive environment also present the United States with opportunities for leadership and partnership. The recently released joint DOD and Intelligence Community NSSS charts a path for the next decade to respond to the current and projected space strategic environment.

The NSSS seeks to maintain and enhance the national security benefits the United States derives from its activities and capabilities in space while addressing and shaping the strategic environment and strengthening the foundations of our space enterprise. The strategy identifies three U.S. national security space objectives: strengthen safety, stability, and security in space; maintain and enhance the strategic national security advantages afforded to the United States by space; and energize the space industrial base that supports U.S. national security. Achieving these objectives will ensure our military continued access to space-based assets national security purposes.

The United States will retain leadership in space by strengthening our space capabilities and improving our collaboration with others worldwide. Leadership cannot be predicated on declaratory policy alone. It must build upon a willingness to maintain strategic advantages while working with the international community to develop collective norms, share information, and collaborate on capabilities. Thus the United States will pursue a set of five interrelated strategic approaches to meet our national security space objectives and enhance U.S. leadership in space, as outlined in the NSSS.

PROMOTE RESPONSIBLE, PEACEFUL, AND SAFE USE OF SPACE

The United States will promote the responsible, peaceful, and safe use of space as the foundational step to addressing the congested and contested space domain. A more cooperative, predictable environment enhances U.S. national security and discourages destabilizing crisis behavior. The United States will encourage responsible behavior in space and will support development of data standards, best practices, transparency and confidence-building measures, and norms of behavior for re-

sponsible space operations. The United States will consider proposals and concepts for arms control measures if they are equitable, effectively verifiable, and enhance the national security of the United States.

With increasing congestion in the space domain, efforts to develop and share situational awareness can help bring order to the congestion and prevent mishaps, misperceptions, and mistrust. DOD will continue to improve the quantity and quality of the space situational awareness (SSA) information it obtains and, in coordination with other government agencies, will seek to establish agreements with other nations and commercial firms to enhance spaceflight safety for all parties. DOD is also pursuing opportunities to expand sharing of space situational awareness data to increase transparency and cooperation in the domain. U.S. Strategic Command (STRATCOM) has entered into agreements with 23 companies, including both launch providers and satellite owners and operators, to improve spaceflight safety.

The United States is pursuing a number of initiatives to promote the responsible use of space. In keeping with the new strategy and the President's National Space Policy, we are currently evaluating the European Union's (EU) proposed international Code of Conduct for Outer Space Activities as a pragmatic first set of guidelines for safe activity in space. We are also discussing the Code with other space-faring countries, including our key allies, as well as Russia, China, and India. The administration has not made a final determination on the EU proposal, and DOD is assessing its operational impact. However, our preliminary assessment finds it a positive approach to promoting responsible behavior in space, enhancing our national security in the process.

Promoting transparency for responsible space operations will enhance the security of the United States by singling out those actors who seek to disrupt peaceful uses of outer space. As a concrete step towards transparency, DOD recently revised its pre-launch notification policy to include space launch vehicles in addition to ballistic missile launches. DOD will continue to work with the Department of State and other departments to promote responsible behavior worldwide that will help ensure the long-term sustainability of the space environment.

PROVIDE IMPROVED U.S. SPACE CAPABILITIES

Ensuring U.S. capabilities are developed and fielded in a timely, reliable, and responsive manner is critical for military forces to plan and execute effective operations. Improving our acquisition processes, energizing the U.S. space industrial base, enhancing technological innovation, and deliberately developing space professionals are critical enablers to maintaining U.S. space leadership.

The United States seeks to foster a space industrial base that is robust, competitive, flexible, healthy, and delivers reliable space capabilities on time and on budget. International advances in space technology have put increased importance on reforming U.S. export controls to ensure the competitiveness of the U.S. space industrial base while addressing technology security. Secretary Gates has actively called for an overhaul of our export control system. Reforming export controls will facilitate U.S. firms' ability to compete in the international marketplace for capabilities that are, or will soon become, widely available globally, while strengthening our ability to protect the most significant U.S. technology advantages. The NSSS reaffirms the necessity of these reforms and echoes the National Space Policy's call for giving favorable consideration for export of those items and technologies that are generally available on the global market, consistent with U.S. national security interests.

We are exploring innovative acquisition strategies for buying spacecraft, with a focus on block buys. As part of the Secretary of Defense's broader efficiency initiatives, our goals are to: (1) reduce unit cost for "production ready" satellites; (2) enable the Department to acquire these systems more efficiently and affordably; and (3) stabilize production including the industrial base. Our innovative acquisition strategy will include full-funding of two satellite classes—Advanced Extremely High Frequency (in fiscal year 2012) and Space Based Infrared System (in fiscal year 2013)—through the use of advance appropriations. We ask for your support of this approach.

PARTNER WITH RESPONSIBLE NATIONS, INTERNATIONAL ORGANIZATIONS, AND COMMERCIAL FIRMS

The United States will pursue additional opportunities to partner with responsible nations, international organizations, and commercial firms to augment the U.S. National Security Space Posture. Decisions on partnering will be consistent with U.S. policy and international commitments and will consider cost, protection of sources and methods, and effects on the U.S. industrial base. U.S. military per-

sonnel will ensure the appropriate review and release of classified information to enhance partner access to space information.

With our allies, we will explore the development of combined space doctrine that endorse and enable the collaborative sharing of space capabilities in crisis and conflict. DOD is already exploring transforming STRATCOM's Joint Space Operations Center into a Combined Space Operations Center operated with international partners. A Combined Space Operations Center will allow our allies to work side-by-side with U.S. commanders, integrating a coalition approach to space into our day-to-day operations. DOD, in conjunction with the State Department and other appropriate U.S. Government agencies, will work to expand mutually beneficial agreements with key partners to utilize existing and planned capabilities that can augment U.S. national security space capabilities. Wideband Global Satellite Communication is a good example—Australia has joined the constellation and other allies are looking at doing the same. A larger, more international constellation adds resilience and augments our space-based capabilities and forces a potential aggressor to contemplate attacking space systems used by a coalition of countries instead of one country.

We will explore sharing space-derived information as "global utilities" with partnered nations. We will continue to share SSA information to promote responsible and safe space operations and will pursue enhanced sharing of other space services such as missile warning and maritime domain awareness. We will explore the establishment of a collaborative missile warning network to detect attacks against our interests and those of our allies and partners.

Strategic partnerships with commercial firms will be pursued in areas that stabilize costs and improve the resilience of space architectures upon which we rely. Such partnerships enhance national security capabilities by providing opportunities to host national security payloads on commercial spacecraft or by offering innovative opportunities to buy or lease capabilities on-orbit. In an era of limited resources, the DOD will develop space systems only when there is no suitable, cost-effective commercial alternatives or when national security needs dictate. We will also actively promote the sale of capabilities developed by U.S. companies to partner nations. Such capabilities could then be integrated into existing U.S. architectures and networks through arrangements that enhance and diversify U.S. capabilities.

PREVENT AND DETER AGGRESSION AGAINST SPACE INFRASTRUCTURE THAT SUPPORTS U.S. NATIONAL SECURITY

The United States is pursuing a multilayered approach to prevent and deter aggression against U.S. and allied space systems that support our national security. The Department seeks to enhance its capability to dissuade and deter the development, testing, and employment of counterspace systems and prevent and deter aggression against space systems and supporting infrastructure that support U.S. national security.

Many elements of this strategy contribute to this approach. DOD will: support diplomatic efforts to promote norms of responsible behavior in space which may dissuade and impose international costs on irresponsible behavior; pursue international partnerships that encourage potential adversary restraint; improve our ability to attribute attacks; strengthen the resilience of our architectures to deny the benefits of an attack; and retain the right to respond, should deterrence fail.

SSA will continue to be a top priority, as it decreases the risk that an adversary's action could occur without warning or attribution. We are working with the Director of National Intelligence to improve our intelligence posture—predictive awareness, characterization, warning, and attribution, to improve our understanding of activities in the space domain. When combined with efforts to promote responsible behavior, such transparency will facilitate the quick identification of actions that threaten U.S. interests.

Furthermore, the United States will deny adversaries meaningful benefits of attack by improving protection and strengthening the resilience of our architectures. Partnerships as well as alternative U.S. Government approaches such as cross-domain solutions, hosted payloads, responsive options, and other innovative solutions, can deliver capability, should our space systems be attacked. This also will enable our ability to operate in a degraded space environment.

Finally, the United States is developing a range of options to deter, and if necessary, defeat efforts to interfere with U.S. or allied space systems consistent with the inherent right of self-defense and other longstanding principles on international law. Such options could include necessary and proportional responses outside of the space domain.

PREPARE TO DEFEAT ATTACKS AND TO OPERATE IN A DEGRADED ENVIRONMENT

Notwithstanding our efforts to deter, some actors may still pursue counterspace actions as a means of achieving military or political advantage. Our military capabilities must be prepared to operate through a degraded environment and attacks targeted at our space systems and supporting infrastructure. We must deny and defeat an adversary's ability to achieve its objectives.

As DOD invests in space capabilities, it will include resilience as a key criterion in evaluating alternative architectures. Resilience can be achieved in a variety of ways, to include cost-effective space system protection, cross-domain solutions, hosting payloads on a mix of platforms in various orbits, drawing on distributed international and commercial partner capabilities, and developing and maturing responsive space capabilities.

To enhance resilience, DOD will continue to develop mission-effective alternatives, including land, sea, air, and space-based alternatives for critical capabilities currently delivered primarily through space-based platforms. In addition, DOD will seek to establish relationships and agreements whereby we can access partner capabilities if U.S. systems are degraded or unavailable. We will be prepared to use these capabilities to ensure the timely continuity of services in a degraded space environment.

Preparing for attacks must extend to the people and processes relying on space information, operating our space systems, and analyzing space-derived information. Ensuring that our servicemen can operate effectively during an attack on our space assets reduces the benefit of attack. DOD is also developing exercises and training to ensure our ability to access the requisite capabilities and information, from space or through cross-domain solutions, in the event of interference with space capabilities.

CONCLUSION

Our strategy requires active U.S. leadership enabled by an approach that updates, balances, and integrates all of the tools of U.S. power. DOD, in coordination with other departments and agencies, will implement this strategy by updating guidance, plans, doctrine, programs, and operations to reflect the new strategic approach.

DOD included initial steps towards implementing the strategy in its fiscal year 2012 budget and will use the coming year to lay the foundation for changes in fiscal year 2013 and beyond. DOD looks forward to working closely with Congress, industry, and allies to implement this new strategy for space.

Senator NELSON. Thank you.

Dr. Zangardi.

STATEMENT OF JOHN A. ZANGARDI, PH.D., DEPUTY ASSISTANT SECRETARY OF THE NAVY FOR COMMAND, CONTROL, COMMUNICATIONS, COMPUTERS, INTELLIGENCE, INFORMATION OPERATIONS, AND SPACE

Dr. ZANGARDI. Good morning, Mr. Chairman. Thank you very much for giving me the opportunity to testify this afternoon on issues of space.

The Navy continues to provide narrow-band SATCOM for U.S. forces worldwide through the legacy Ultra-High Frequency (UHF) Follow-On (UFO) constellation. We will continue to lease commercial UHF services to supplement existing capacity as required in support of the warfighter. The Navy looks forward to the first on-orbit capability of Satellite No. 1 of the MUOS in 2012. As subsequent MUOS satellites are delivered to replace the fragile UFO constellation, it is critical that the Navy remain postured to provide uninterrupted UHF SATCOM services for the warfighter, including preserving the ability to launch MUOS satellites as they are delivered, in order to mitigate a loss of UFO satellite on-orbit.

Sir, that completes my statement. Thank you.

[The joint prepared statement of Admiral Titley and Dr. Zangardi follows:]

JOINT PREPARED STATEMENT BY RADM DAVID W. TITLEY AND DR. JOHN A ZANGARDI

INTRODUCTION

Mr. Chairman, distinguished members of the subcommittee, we are honored to appear before you today to address the Navy's space activities. Successful Naval operations in the 21st century demand increased global situational awareness and proficiency in the areas of intelligence, cyber defense, ballistic missile defense, information management, and space. To achieve this primacy, the Chief of Naval Operations (CNO) directed the realignment of his staff a year ago to bring all Navy information-related capabilities and systems under a single resource sponsor—the Deputy Chief of Naval Operations for Information Dominance. In the area of space, the OPNAV N2/N6 Information Dominance Directorate has established a single focal point to oversee Navy's space related policies, programs, requirements, investments, and resourcing. Fleet Cyber Command/U.S. Tenth Fleet, established over a year ago to be the Navy's operational lead for information and cyberspace, continues to execute Navy's space operations today.

Our maritime strategy demands a flexible, interoperable and secure global communications capability to support the command and control requirements of highly mobile, geographically dispersed U.S., joint, and coalition forces. Our satellite systems provide a decisive advantage to our deployed forces across the broad spectrum of military operations, from peacetime engagements to humanitarian relief efforts to major combat operations. The Navy relies upon space-based capabilities to achieve information dominance over potential adversaries and enable commanders to exercise effective command and control at all warfare levels and across multiple information enclaves in all domains.

NAVY SPACE REQUIREMENTS

The Navy's interests in space include communications, intelligence, surveillance, reconnaissance, positioning, navigation, timing, missile warning, meteorology, and oceanography capabilities. The Navy continues to engage with the other Services and our interagency partners to ensure that all of our space equities, interests, and requirements are well understood so that the combatant commanders and Navy's operating forces have the space capabilities they need to succeed in their missions.

The Navy remains critically dependent on space to conduct not only its wartime mission, but also its core capabilities of forward presence, deterrence, sea control, power projection, maritime security, humanitarian assistance, and disaster response. Space capabilities are vital to our Nation's maritime operations and are foundational to our ability to operate in a networked and dispersed manner. As the recently signed Navy Space Strategy states, space provides the ultimate crow's nest for maritime operations.

The Navy's mission of ensuring the security of our citizens at home and abroad requires a global reach and persistent presence. Our ability to conduct missions of mercy or rapidly deploy decisive combat power, in concert with the other Services and our coalition partners, depends on assured space capabilities with inherent flexibility and responsiveness to support our worldwide responsibilities. In accordance with the National Space Policy and National Security Space Strategy (NSSS), commercial and foreign partner capabilities have become increasingly useful in bridging the gap between requirements and capabilities. The Navy will continue to work with the commercial sector and foreign partners to explore options that address multiple maritime mission requirements. Decisions to exploit these partnerships, though, must include consideration of the information assurance risks inherent in the capabilities being employed. Further, these decisions must be based on feasibility and affordability assessments and cost, benefit, and risk analysis.

Due to the long lead times involved in fielding complex space programs, it is essential that Navy requirements and maritime missions are factored into the prelaunch design and planned on-orbit operation of future satellite acquisitions. The Navy is actively engaged with key national and joint space-related organizations to ensure current and future Navy needs in space are identified and incorporated. Further, we welcome the opportunity to participate in the recently chartered Defense Space Council as a senior-level forum to discuss Navy space equities with the Office of the Secretary of Defense, the Intelligence Community, and the Services who are represented at the Secretary and Under Secretary level.

NAVY SPACE INVESTMENTS

Nearly 50 percent of Navy's current fiscal contributions to space remains dedicated to the acquisition, development and management of the Ultra High Frequency (UHF) Follow-On (UFO) and Mobile User Objective System (MUOS) communica-

tions satellite systems. The remainder is predominantly apportioned to acquisition of the various satellite receiver terminals and equipment for Navy units, and space-based navigation, oceanography, and meteorology.

Additionally, the Navy invests in space-related Science and Technology/Research and Development efforts that address maritime-related capability gaps critical to the successful execution of our Nation's maritime strategy. In this fiscally-constrained environment, investments have been modest.

The Navy depends on space capabilities now, and expects the demand for space capabilities to grow in the future, especially in the area of satellite communications (SATCOM). The Navy's major space segment responsibility to the joint community is the UHF narrowband SATCOM constellation. Today this constellation consists of eight UFO satellites, two residual Fleet Satellites (FLTSAT), one Leased Satellite (LEASAT–5), and leased capacity on SKYNET–5C. MUOS will begin to replace these systems in May 2012. Based on evolving warfighting concepts, UHF SATCOM requirements are expected to grow, and MUOS, as designed, will support those requirements.

MOBILE USER OBJECTIVE SYSTEM

The increasing joint demand for SATCOM access at ever-higher data rates requires moving beyond current legacy UHF satellite capabilities. MUOS will help satisfy those demands when initial operational capability is reached in fiscal year 2012. The first satellite in the planned constellation of four operational satellites, with one on-orbit spare, is now scheduled for on-orbit capability in May 2012. Previously, Navy planned for the first MUOS satellite to achieve on-orbit capability in December 2011; however, the launches of several higher priority spacecraft have dictated a primary launch date in February 2012. Over the past year, the MUOS program made significant progress completing electromagnetic interference testing of spacecraft #1, propulsion and satellite bus mating of spacecraft #2, and development of the ground infrastructure required to support MUOS launch. MUOS program performance continues to support a Fall 2011 launch should a date become available. Navy's fiscal year 2012 budget submission continues our investment in MUOS to replace the aging UFO constellation.

MUOS will support Unified Commands and Joint Task Force Components, Department of Defense (DOD) and non-DOD agencies, and our coalition partners by providing worldwide tactical narrowband netted, point-to-point, and broadcast voice and data services in challenging environments, including double-canopy foliage, urban environments, high sea states, and all weather conditions. MUOS will carry two distinct payloads. The legacy UHF payload will provide the capability of a UFO satellite, while a new UHF waveform payload will significantly increase the number of accesses while also increasing available throughput to the warfighter.

MUOS will be the common denominator for future command and control, enhancing the capability to communicate from the tactical edge to theater headquarters. MUOS will allow more comprehensive and coordinated support to regional engagement efforts, providing the capability to synchronize actions with other Services and agencies. This capability will be realized through the fielding of MUOS capable Joint Tactical Radio System terminals and by upgrading existing legacy UHF software programmable terminals.

DELIVERING MUOS

The timely delivery of MUOS is a high priority for Navy, and we recognize both our responsibility and commitment to providing this vital warfighting capability to all our DOD, Intelligence Community and Interagency partners. The delay in delivery of the MUOS system, coupled with the age and fragility of the current UHF satellite constellation, has our full attention and focus.

Navy has taken several proactive steps to minimize the operational impact if a gap in UHF satellite availability occurs. We have completed a payload reconfiguration on UFO satellite Flight 11 that significantly increased the number of available channels. We completed this action at no cost and with very low risk to the spacecraft. A recent modification to the frequency plan on FLTSAT 8 allowed us to optimize the UFO satellite Flight 7 and provide two additional channels at no cost. Additionally, the Navy continues to lease supplemental UHF resources from two commercial satellite systems, LEASAT and SKYNET. Our total mitigation efforts to date are providing the equivalent capacity of an additional UFO satellite. Navy has also explored options using commercially hosted payloads, but all possible material solutions would not address potential near term gaps. We will keep these options in reserve if their use becomes necessary.

We are also continuing efforts to make more efficient use of our currently available satellite resources. The Integrated Waveform (IW), a software upgrade to UHF SATCOM tactical terminals and control system, completed operational testing and is currently being deployed. IW will optimize our use of UHF satellite channels by doubling the number of accesses that can be supported by a single 25 kHz channel. DOD has also signed a Memorandum of Understanding with the Australian Ministry of Defense (MOD) for use of channels on an Australian-hosted payload covering the Indian Ocean region. In exchange, the United States will provide the Australian MOD use of equivalent UHF SATCOM accesses in the Pacific Ocean region commencing in 2018. Finally, we are exploring the use of TACSAT–4, an Office of Naval Research and Naval Research Laboratory co-led development that supports Operationally Responsive Space Office efforts. TACSAT–4 may provide a very limited operational capability when it reaches on-orbit capability later this summer.

ENVIRONMENTAL REMOTE SENSING

The Navy provides DOD with global atmospheric modeling, and global and regional ocean modeling. We rely on partnerships with the Air Force, and civil and international agencies to meet our space-based environmental sensing requirements. Meeting these requirements is critical to the execution of missions that enhance safe, effective military operations. For our future, the Navy is engaged in defining the requirements for the DOD Defense Weather Satellite System and the National Oceanic and Atmospheric Administration's Joint Polar Satellite System, which will together satisfy a large portion of the Navy's environmental sensing requirements over the next 15 years.

In support of the new National Space Policy, the Navy is adopting a new strategy to meet its unique space-based ocean altimetry requirements. We have deferred procurement of the Navy Altimeter satellite (GEOSAT follow-on) until fiscal year 2016 with full operational capability achieved in fiscal year 2021. In the interim, the Navy is seeking to enter partnerships with civil and international agencies to satisfy our altimetry requirements.

POSITIONING, NAVIGATION, AND TIMING

The Navy continues to rely upon the Air Force's Global Positioning System (GPS) to meet the vast majority of our positioning, navigation, and timing (PNT) requirements. The Navy intends to award a contract this year for the GPS-based PNT service which will modernize our aging shipboard PNT systems and provide enhanced PNT assurance by implementing jam-resistant antennas, a Selective Availability Anti-Spoofing Module, and a foundation for future M-code implementation. The Navy is also investigating the impact of a GPS-challenged environment on maintaining synchronized timing across our full suite of combat and communications systems.

The Navy is continuing the technology development phase of the Joint Milli-Arcsecond Pathfinder Survey satellite, transitioning from Science and Technology to a major acquisition category program, which will update the DOD star catalog to meet positioning and orientation accuracy requirements for the next several decades.

INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE

A robust architecture of signals and geospatial intelligence systems to meet current and emerging requirements remains crucial to successful maritime operations. It is imperative that Intelligence, Surveillance, and Reconnaissance capabilities be funded and fielded in sufficient quantity and capacity to sustain continuity of essential space-based intelligence data throughout the maritime domain. Accordingly, we fully support Office of the Director of National Intelligence collaboration with combatant commands and Services to ensure emerging requirements are adequately supported by future Intelligence Community collection systems.

These intelligence, surveillance, and reconnaissance capabilities are indispensable contributors to maritime domain awareness. As the Nation continues to develop and field these and future capabilities, persistent coverage in the maritime domain remains a key requirement. A constrained fiscal environment will no doubt make this challenging, but, in accordance with the National Space Policy and NSSS, emerging capabilities are being explored with our coalition and commercial partners in an effort to reduce costs while increasing capability.

COMMERCIAL SPACE SYSTEMS

Commercially provided systems provide the ability to augment, but not replace, existing national and military systems. These commercial capabilities have become increasingly useful in bridging the gap between requirements and capabilities. The Navy has used commercial communications satellites since the early 1990s to augment bandwidth requirements not fully satisfied by military communications satellites. Technical advances in the commercial sector provide opportunities for rapid capability implementation not only for communications, but in other mission areas as well, such as safety of navigation and intelligence, surveillance, and reconnaissance. The Navy continues to work with the commercial sector to explore options to address multiple maritime mission requirements, and we continue to field systems, such as Commercial Broadband Satellite Program terminals, to fully leverage available commercial capability. Potential cost savings and capability supplementation should continue to be evaluated for all commercially-provided space-based capabilities at every opportunity.

SPACE CADRE

Our Navy equities, requirements, operations, and management of space resources are the responsibility of a small but agile corps of space professionals that make the Navy's use of space possible. The Navy's Space Cadre is comprised of approximately 1,350 Reserve, civil, and active duty service personnel from all warfighter designators and communities, and is a key component of the DOD's 15,000 military and civilian space professionals. Part of our Total Workforce strategy is to ensure that fully qualified Navy Space Cadre personnel are consistently assigned to our most critical and influential space billets. This strategy requires the Navy to continue to recruit and retain a talented and highly skilled workforce to fill vital space leadership positions now and into the future. We continue to assign personnel with a proven capacity to represent unique Navy requirements for space systems in the joint acquisition processes at the National Reconnaissance Office. To enable us to do this more efficiently, we are developing specific career progression plans to actively manage space experts' individual career paths to ensure that Navy and joint space-related assignments complement and enhance career progression and promotion opportunities while infusing naval operational expertise back into the space community.

CONCLUSION

In closing, we would like to reiterate that space capabilities will continue to be critical to our Nation's success in the maritime domain. We operate in an increasingly dynamic and challenging global environment, demanding additional capability and more capacity to operate in a networked but geographically dispersed fashion. A robust space layer is essential to providing the Nation's soldiers, sailors, airmen, and marines with the situational awareness and force capacity to operate, fight, and succeed in a myriad of missions.

Navy is leaning forward in the use, advocacy, and development of space capabilities. We are building and fielding the necessary space-based systems across multiple mission areas and the plan we have submitted will deliver the future space-based capabilities within the fiscal constraints of the budget.

Thank you for the opportunity to share our efforts with you today. Continued support from this subcommittee and Congress is deeply appreciated.

Senator NELSON. Thank you.

General Helms.

STATEMENT OF LT. GEN. SUSAN J. HELMS, USAF, COMMANDER, JOINT FUNCTIONAL COMPONENT COMMAND FOR SPACE, U.S. STRATEGIC COMMAND

General HELMS. Good afternoon, Chairman Nelson. I am honored to appear before you as STRATCOM's Commander for JFCC Space. This is my first opportunity to come before you as the Commander and I look forward to working with you and the other subcommittee members to enhance the United States' standing as a global leader in space.

It's an honor to represent the more than 3,000 soldiers, sailors, airmen, and marines of JFCC Space, as well as our exchange officers from Australia, Canada, and the United Kingdom. These men and women form a tireless and innovative Joint Force supporting our warfighters 24 hours a day, 365 days a year.

Operating within an increasingly congested, contested, and competitive space environment requires strategically reexamining our processes, planning flexibility, improving awareness of the space environment, and expanding collaboration efforts with all spacefaring nations and corporations. Correctly adapting our operations will allow JFCC Space to continue to provide the following capabilities to the Joint Force: Unmatched position, navigation, and timing information; missile warning and missile defense; communications, intelligence, surveillance, reconnaissance (ISR) support; and technical intelligence and characterization of the operational environment.

In today's strategic world, JFCC Space is at the forefront of defending our ability to operate freely within space. We continue to search out better ways to support those in harm's way. We will continue to develop and employ systems to enhance our comprehensive space situational awareness. We will strive to strengthen our relationships with allied and industry space partners, ensuring our global capabilities remain available for those requiring them.

You can be proud of the soldiers, sailors, airmen, and marines of JFCC Space. I thank the subcommittee for your continued support as we work to preserve and enhance our space capabilities for our Nation.

Thank you, sir.

[The prepared statement of General Helms follows:]

PREPARED STATEMENT BY LT. GEN. SUSAN J. HELMS, USAF

Chairman Nelson, Senator Sessions, and members of the subcommittee, I am honored to appear before you as U.S. Strategic Command's (STRATCOM) Commander of the Joint Functional Component Command for Space (JFCC Space). This is my first opportunity to come before you as the Commander for JFCC Space and I look forward to working with you to enhance the United States standing as a global leader in space.

It's an honor to represent the more than 3,000 soldiers, sailors, airmen, and marines of JFCC Space. In addition to our active duty military members, JFCC Space has more than 1,000 National Guard, Reserve unit members and Individual Mobilization Augmentees, as well as, exchange officers from Australia, Canada, and the United Kingdom. These men and women form a tireless and innovative Joint Force, working hard to provide position, navigation, and timing information; missile warning and missile defense; communications; intelligence, surveillance, and reconnaissance support; and technical intelligence and personnel recovery to our warfighters 24 hours a day, 365 days a year.

The space environment has become increasingly congested, contested and competitive. Operating within space is correspondingly more uncertain than ever in our past. Addressing the changes in the environment requires strategically rethinking our processes, integrating extra flexibility in our planning, improving our awareness of the space environment and expanding our collaboration with all space faring nations and corporations. Correctly adapting our operations within the space environment before we are required to respond to an unforeseen circumstance will allow JFCC Space to continue to provide space capabilities to our Joint Force throughout these uncertain times.

One of our premier responsibilities is to deliver space effects to the Joint Force. As the most prevalent space effect delivered by my operators, we have continued to operate and improve the most widely used space capability on the planet, the global positioning system (GPS) constellation. In January we completed the first phase of our "Expandable 24" operation, the largest satellite repositioning effort in

GPS program history. This two phase operation repositioned three satellites to optimize GPS coverage for terrain-challenged environments, such as cities and the mountains and valleys of Afghanistan. We also began operations of the newest GPS variant, the GPS IIF, which will add a second civilian safety-of-life signal and provide more robust signal availability for military users.

Our Overhead Persistent Infrared (OPIR) capabilities in space are the stalwart to providing critical ballistic missile warning to field commanders and national leaders. At least 20 nations currently have nuclear, biological or chemical weapons, and the technology to deliver them over long distances. According to intelligence estimates, during the next 10 years, additional countries will develop the technology and capability to launch intercontinental ballistic missiles at the United States. Our detection systems provide both strategic warning for intercontinental ballistic missile (ICBM) and space launches as well as tactical warning for shorter-range ballistic missile launches. Space based missile warning satellites are able to provide continuous global coverage. These systems are capable of providing missile warning to the Joint Force and coalition partners in the event of a short-range ballistic missile attack. In addition, deployed units throughout the world provide Geographic Combatant Commanders the means of receiving missile warning data direct from the Defense Support Program (DSP) constellation for their area of responsibility. Space OPIR continues to ensure missile threats are detected and reported in a timely fashion but the technology continues to advance and we are constantly finding new ways to provide better battlespace awareness and technical intelligence to the ground commanders beyond our foundational ballistic missile warning mission. The Space-Based Infrared System (SBIRS) in its highly elliptical orbit (HEO) gives significant coverage over the northern hemisphere for infrared detection and technical intelligence gathering. We can now detect and report, in near real-time, natural and man-made infrared events. The quality of data provided by SBIRS HEO is a key part in our ability to characterize launches and predict threats within minutes. Following its operational acceptance, the first SBIRS in its geosynchronous orbit will give us the ability to paint a picture for national leadership of new foreign technology development and proliferation information. This capability is so significant that the SBIRS community is developing a pre-certified use plan to get valuable information to the Joint Force as soon as practical.

These space based sensors are only one portion of our missile warning capability. Ground-based radars provide warning by detecting, tracking and counting individual objects in a missile attack early in their trajectory. Several of the ground based radars are integrated into the Ballistic Missile Defense System used by the Missile Defense Agency to improve midcourse sensor coverage by providing critical early warning, tracking, object classification and cueing data.

Information technologies have truly revolutionized our capability to operate globally. From combat operations to humanitarian assistance, we use military satellite communications every day. In addition to GPS and OPIR capabilities, JFCC Space provides to the Joint Force protected, wideband and narrowband satellite communication capabilities.

Protected communications make possible the ability to command and control forces and support national decisionmakers in a contested communications environment, including the high end nuclear environment.

Wideband satellite communication provides automatic Digital Network/automatic Secure Voice Communications, Secret Internet Protocol Router Network and Joint Worldwide Intelligence Communication System access from space. Additionally wideband communications include relays for Defense Message System, Defense Switched Network, Diplomatic Telecommunication Service Communications and real-time Unmanned Aerial Vehicle video for ground mobile forces.

In the category of narrowband communications, our ultra-high frequency follow-on (UHF) satellite system, is the space-based portion of the Department of Defense (DOD) communication system that enables reliable communications among aircraft, ships, submarines, ground stations and the presidential command network as well as a multitude of joint and allied users. UHF satellite communications is a primary enabler for distributed command and control, critical for dispersed maritime operations, and provides critical communications for humanitarian assistance and disaster relief efforts such as the Haitian and Japanese earthquake. DOD provided more than 20 UHF satellite communications channels dedicated for supporting tsunami relief efforts in Japan.

JFCC Space is forging ahead in our efforts to provide new, operationally responsive space effects to the Joint Force. We are actively engaged with Air Force Space Command and STRATCOM in developing the concepts and command relationships that may allow us to quickly transition rapid development capabilities to operational use. For example, the TACSAT–3 satellite has an experimental, hyper-spectral im-

agery payload that has shown great promise in support for ground troops as well as in disaster relief and recovery operations. We are also working with Service partners to deploy the Operational Responsive Space (ORS)–1, a small spacecraft that will supply urgently-needed imagery to Central Command.

Day to day, JFCC Space tasks our space based assets to provide standard space support to the Joint Force. We maintain a close and dedicated relationship with each theater's Space Coordinating Authority (SCA). Through the SCA relationship JFCC Space is proactively postured to rapidly adapt to changing mission requirements based on combatant commander's changing needs. JFCC Space, through the Joint Space Operations Center (JSpOC), coordinated specific support to the U.S. response to the March 11 earthquake and tsunami in Japan and ongoing coalition military operations over Libya. These efforts include using data from the hyperspectral sensor on TACSAT–3 to help contain the damage at the Fukushima Daiichi Nuclear Power Plant. In support of the North Atlantic Treaty Organization's Operation Unified Protector, JFCC Space tailors theater missile warning coverage, strike assessment and technical intelligence support for coalition forces protecting Libyan civilians and civilian-populated areas.

Space situational awareness (SSA) is the cornerstone of JFCC Space operations and the space surveillance network (SSN) is the workhorse of our SSA. The data provided by the space surveillance network are analyzed at the JSpOC by a collection of military and civilian analysts. These analysts keep track of what satellites are active, predict when pieces of debris or satellites will re-enter the atmosphere or collide, and provide vital information to decisionmakers about when a payload can be safely launched. Over the past 2 years, we have increased daily conjunction screening at the JSpOC from 110 primary satellites to all active satellites (over 1,100). Due to this increase in number of satellites screened, we have seen conjunction warning notifications increase from 5 to up to 25 per day, up 46 percent from 2009 and we have had a corresponding increase in our interaction with commercial and foreign government space operators. Information sharing with commercial and foreign entities is now a routine occurrence executed via a formalized process within JFCC Space. We currently have data sharing agreements with 23 commercial and foreign partners.

However, we still suffer from an aged and limited sensor network to gather our most important SSA resource: orbital observations. Many of our SSN sensors operate on a one-object-at-a-time system and a majority of the SSN sensors are not networked with one another. The Continental United States (CONUS)-based space fence and our Eglin SSN sensor are currently the only machine-to-machine network between SSN radars. These networked sensors are resulting in 30,000 observations per year that would otherwise go undetected due to sensor limitations with Eglin's space surveillance fence. We could see a huge benefit to our SSA through greater machine-to-machine networking between our SSN sensors. The CONUS-based space fence can detect and observe multiple objects at one time and contributes more observations to our network than any other sensor. Additionally, we have considerable gaps in coverage in the southern hemisphere. Placement of a space fence in the southern hemisphere will improve our coverage considerably. Another sensor that will improve our capability is the Space-Based Space Surveillance (SBSS) satellite launched in September. This sensor operates from space, free of boundaries, borders, or atmospheric effects to distort or obscure viewing. With a potential capability to track objects much smaller in size than what our older sensors can track, SBSS will detect significantly more objects in orbit and produce a corresponding increase in the volume of SSA data. Current analytic and processing capacity in the JSpOC is not sufficient to exploit the full capacity of this or other future sensors. This shortfall is driving an urgent need to upgrade JSpOC systems. The JSpOC Mission System (JMS) is the Air Force's program of record for solving this problem and ensuring the JSpOC is properly equipped to handle the mission is part of my service function as commander of 14th Air Force.

The JMS is planned to replace our legacy command and control systems designed in the 1980s and fielded in the 1990s. We are working closely with the acquisition team to prioritize our mission requirements. In the months ahead we intend to employ an early JMS release that will significantly enhance our ability to understand the space situation with an integrated operating picture, as well as the ability to respond to a dynamic space environment. We will continue to build upon this initial capability to ensure our operators on the JSpOC floor have the tools, and the infrastructure, they need to accomplish the mission.

We cannot properly equip the JSpOC without addressing our current facilities and the need for modern infrastructure to house the state of the art command and control system and the JSpOC personnel. Today the JSpOC performs its operational mission from a converted missile assembly building. Over 50 years old and designed

for an entirely different purpose, the building presents significant challenges towards meeting our integrated space operations mission. Successful integration with U.S. and coalition forces, as well as commercial partners will depend upon a future military construction project for new facilities designed specifically for space command and control.

SSA is not only an understanding of the physical objects within space but also includes characterizing disruptions to services provided by satellite signals transmitted through space. JFCC Space provides the capability to monitor the service quality of U.S. and coalition satellite communications systems in order to detect interference which may ultimately be determined to be either unintentional incidents or purposeful acts. When an interference event is detected, JFCC Space receives support from other elements of STRATCOM to geolocate the source of interference. In these efforts, we continue to build on the early successes of current programs leading to the development of new systems to be deployed later this year in order to conduct electromagnetic interference detection in different frequencies and different locations throughout the world. These efforts support broader U.S. Government efforts—in cooperation with civil, commercial, and foreign partners—to identify, locate, and attribute sources of radio frequency interference, and take necessary measures to sustain the radiofrequency environment in which critical U.S. space systems operate.

Consistent with the President's National Space Policy and the National Security Space Strategy, we are working with the Department of State to expand our current partnerships and develop new partnerships through transparency and cooperation with partners and allies, including industry partners. The United States will continue to promote safe and responsible space operations both for ourselves and with other space faring nations and industry partners. Our leadership in the development of best practices and bilateral and multilateral transparency and confidence building measures to encourage responsible actions in, and the peaceful use of, space, is of critical importance. As the National Space Policy states, it is the shared interest of all nations to act responsibly in space to help prevent mishaps, misperceptions, and mistrust.

A Combined Space Operations concept is a starting place and we will work with our closest allies to flesh out and mature the concept toward mutually supportive goals. The concept must be expandable and tailorable to allow the flexibility to incorporate partners beyond our own U.S. Government agencies and closest allies.

As resources permit, we plan to continue expanding the SSA information and services we offer. In coordination with the Department of State and civilian departments and agencies, we intend to enter into SSA Sharing agreements with foreign governments and international organizations, and build upon our bilateral space cooperation dialogues with key allies and partners. These dialogues have already resulted in agreements in principle for SSA cooperation between DOD and its counterparts in Australia, Canada, and France. SSA Sharing agreements—combined with ongoing discussions on SSA cooperation with other allies as well as the European Space Agency and European Union—will put us on a path to improve collective awareness of the space domain and work to preserve its advantages for all.

Space operations continue to evolve rapidly and JFCC Space is at the forefront of defending our ability to operate within space. We continue to search out better ways to support Joint Forces around the globe, especially those in harm's way. We will continue to develop and employ systems to enhance our comprehensive SSA. We will strive to strengthen our relationships with allied and industry space partners, ensuring our global capabilities remain available for those requiring them. You can be proud of the soldiers, sailors, airmen, and marines of JFCC Space. I thank the committee for your continued support as we work to preserve and enhance the critical space capabilities of our Nation.

Senator NELSON. Thank you.

General Formica.

STATEMENT OF LTG RICHARD P. FORMICA, USA, COMMANDER, U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND/ARMY FORCES STRATEGIC COMMAND

General FORMICA. Good afternoon, Mr. Chairman, and again thank you for your ongoing support of our soldiers, civilians, and families. I appear today as the Commander of the Army's Space and Missile Defense Command and Army Forces Strategic Command. I'm honored to testify before this committee. You've been a

strong supporter of the Army and the key capabilities that space affords our warfighters and we value your continued support.

My purpose today is to inform the committee about the Army as a user of space capabilities, to summarize the Army's space strategy and policy, and to discuss the space capabilities provided by the Army. These are provided in more detail in my written statement which was prepared and provided for the record. I'll briefly summarize those three, sir.

As a user of space capabilities, the Army depends on position, navigation, timing, communications, ISR, assured missile warning, and weather. The space-based services are critical enablers to our forces and assured access to space-based capabilities is a critical element in the Army's ability to shoot, move, and communicate. While we may face localized tactical disruptions, our Army does not want to face a day without space-based capabilities.

The Army's space policy and strategic plan provide our priorities and equities for space capabilities and forces. Our focus is on leveraging DOD and national space assets in partnership with the joint community to provide assured access of space-based capabilities in support of full-spectrum operations.

The Army provides critical space capabilities for the combatant commanders and to the warfighter. In our space role, we have three core tasks: providing trained and ready space forces and capabilities to combatant commanders and to the warfighter; building future space forces; and researching, developing, testing, and integrating future space capabilities.

Our command is uniquely organized in the Army to perform these three tasks, with operations, capability development, and materiel development functions. We are also geographically well-positioned in Huntsville, AL, and Colorado Springs, CO, to capitalize on the tech bases there. Our space capabilities are positioned in 14 other locations around the globe to accomplish these 3 core tasks.

In conclusion, the Army is critically dependent upon the capabilities that space brings to the battlefield and seeks assured access to those capabilities. I appreciate the opportunity to speak on these important matters and I look forward to your questions.

Thank you.

[The prepared statement of General Formica follows:]

PREPARED STATEMENT BY LTG RICHARD P. FORMICA, USA

INTRODUCTION

Mr. Chairman, Ranking Member Sessions, and distinguished members of the subcommittee, thank you for your ongoing support of our soldiers, civilians, and families, as well as the opportunity to testify before this panel. This marks my first appearance before the Strategic Forces Subcommittee of the Senate Armed Services Committee, a body that has been a strong supporter of the Army and the key capabilities that space affords our warfighters. Your continued support is important as we pursue our joint efforts to provide critical space capabilities in support of our Nation, our fighting forces, and our allies.

In my current assignment, I wear three hats: first, as the commander of the U.S. Army Space and Missile Defense Command, I have Title 10 responsibilities to train, maintain, and equip space and missile defense forces for the Army. Second, as the Army Forces Strategic Command, I am the Army Service Component Commander (ASCC) to the U.S. Strategic Command (STRATCOM) charged with the responsibility for planning, integrating, and coordinating Army forces and capabilities in support of strategic missions. Third, I serve as STRATCOM's Commander of the Joint Functional Component Command for Integrated Missile Defense (JFCC–IMD)

in order to leverage the capabilities and skill sets of U.S. Army Space and Missile Defense Command/Army Forces Strategic Command (ASMDC/ARSTRAT).

In my role here today as the Commander of ASMDC/ARSTRAT and the ASCC to STRATCOM, I am honored to testify before you with these distinguished witnesses—all providers of critical space capabilities to the warfighter and as essential contributors to the joint space planning process and our Nation's continued advances to effectively operate in space. Within the Army, space operations and space-related activities are pursued as an enterprise and are not the exclusive domain of the ASMDC/ARSTRAT or any other single branch or functional proponent.

My purpose today is to outline the Army as a user of space capabilities; to articulate the Army's space strategy and policy; and to inform the committee about the Army as a provider of space capabilities.

THE ARMY AS A USER OF SPACE CAPABILITIES

As America's principal land force, our Army must be organized, trained, and equipped to provide responsive and sustained combat operations in order to fight as a joint team and to respond, as directed, to crises at home and abroad. Geopolitical uncertainties and nearly a decade of continuous combat have necessitated a high degree of operational adaptability. The Army's Operating Concept identifies six warfighting functional concepts that contribute to operational adaptability: mission command, movement and maneuver, intelligence, protection, fires, and sustainment. Space-based capabilities leveraged and employed across the Army Space enterprise enable each of these warfighting functions. Simply put, space-based capabilities are critical elements to the Army's ability to shoot, move, and communicate.

The Army is reliant on space-based systems, such as global positioning satellites, communication satellites, weather satellites, and intelligence collection platforms. They are critical enablers to our ability to plan, communicate, navigate, and maintain battlefield situational awareness, engage the enemy, provide missile warning, and protect and sustain our forces. For example, the Army is dependent on the DOD's Defense Weather Satellite System capabilities to meet its military weather forecasting requirements. The Army continuously works with the Air Force to define our requirements in order to ensure future warfighters have access to essential weather data. Most of these services are so well integrated into weapon systems and support processes that Soldiers are unaware of the space connection. This seamless integration is due in large part to the coordination and cooperation of space professionals at the Air Force Space Command, STRATCOM's Joint Functional Component Command for Space, the Navy, the Army, and other Department of Defense (DOD) and joint agencies.

The Army's unrelenting dependency on space-based capabilities requires active participation in defining space-related capability needs. The identified needs serve to ensure necessary joint force structure, systems, and concept of operations are developed and acquired, thereby enabling the land force to conduct the full range of military operations now and in the future.

Ensuring tactical and assured access to space is our focus—reassuring the requisite capabilities and effects are delivered to the tactical warfighter on time, every time demands that our space capabilities and architectures become more resilient against attacks and disruption. We must ensure that our Army does not face a day without space and space-related capabilities.

THE ARMY'S SPACE POLICY AND STRATEGIC PLAN

The Army Space Policy, most recently updated in 2009, focuses on the operational and tactical needs of land forces and assigns space related Army organizational responsibilities. It follows implemented DOD space policies and procedures, reestablishes objectives for Army space, and continues the Army Space Council. The Army's Space Policy outlines four broad space related objectives:

- To maximize the effectiveness of current space capabilities in support of operational and tactical land warfighting needs.
- To influence the design, development, acquisition, and concepts of operation of future space systems that enable and enhance current and future land forces.
- To advance the development and effective use of responsive, timely, and assured joint interoperable space capabilities.
- To seamlessly integrate relevant space capabilities into the operating force.

The Army recently drafted its Army Space Strategic Plan, which is in final coordination with the Chief of Staff of the Army. This document is shaped by national level guidance, such as the National Space Policy and the National Security Space

Strategy. The draft plan, coupled with the Army's Space Policy, outlines the Army's space enterprise path for strategic planning, programming, and resourcing.

The essence of our space strategy and the guiding vision of the Army space enterprise are to assure access to resilient and relevant space-enabled capabilities to ensure Army forces can conduct full spectrum operations. To achieve this, our draft space strategy rests on three tenets that link Army strategic planning and programming for space to the guidance in national and DOD space policy and strategy. The three essential tenets are:

- To enable the Army's enduring mission by providing requisite space-enabled capabilities to support current operations, as well as future transformation efforts.
- To leverage existing DOD, national, commercial, and international space-based capabilities.
- To pursue cross-domain solutions to create a resilient architecture to mitigate threats, vulnerabilities, and assure access to critical capabilities needed to sustain land force operations.

THE ARMY—A PROVIDER OF SPACE CAPABILITIES

The Army is a provider of space capabilities. Historically, our greatest investment in space capabilities has been in the ground segment—the integration of space capabilities into operational forces through command and control systems, communication terminals, and intelligence feeds. However, due to the critical importance of space capabilities, the Army has strengthened and broadened its investment to include exploitation of national and strategic space capabilities, defensive counterspace, leveraging the capabilities of space to enhance missile defense systems, and training and development of space professionals and space enablers.

In 2012, the Army plans to invest approximately $500 million in pursuing space and space-related activities, evolving from a position of simply exploiting strategic space-based capabilities to a position where the Army is fully integrated into the planning, development, and use of theater-focused operational and tactical space applications.

ASMDC/ARSTRAT is the Army's space proponent, and coordinates with the Army Intelligence and Signal communities, STRATCOM, and other members of the joint community to bring space-based capabilities to the warfighter. ASMDC/ARSTRAT is at the forefront—providing trained and ready space forces and capabilities to the combatant commanders and the warfighter and building future space forces. Aside from delivering and integrating space products and trained professionals to joint warfighter operations, ASMDC/ARSTRAT also conducts space mission related research and development activities. I would like to highlight our space provider role within three core tasks: providing trained and ready space forces and capabilities to the combatant commanders and the warfighter; building future space forces; and researching, developing, testing, and integrating future space capabilities.

Providing Trained and Ready Space Forces and Capabilities

Over 1,100 soldiers and civilians serving with ASMDC/ARSTRAT's 1st Space Brigade provide access to products and services that are essential in all phases of combat operations. The brigade's three battalions, comprised of Active, National Guard, and Reserve soldiers, support combatant commanders by providing satellite communications, space operations, missile warning, and forward deployed space support teams. These Space Operations Officers, along with members of the Army's Space Cadre, directly influence the execution of strategic operations in support of tactical level ground maneuver forces. Their principal duties include planning, developing, resourcing, acquiring, integrating, and operating space forces, systems, concepts, applications, or capabilities in any element of the DOD space mission areas.

During the 1990s, realizing the essential need of space professionals, the Army created Functional Area (FA) 40—Space Operations Officers—within our commissioned officer corps. ASMDC/ARSTRAT is the Army's personnel developer for FA 40 officers. The approximately 300 FA 40s serve in Army, joint, and DOD commands and organizations across all echelons—tactical, operational, and strategic. The Army's Space Cadre, initiated in 2007, is comprised of both military and civilian personnel who represent the Army's interests in space operations, policy, science and technology, and acquisition. The Cadre consists of soldiers and civilians from a wide variety of branches, career fields, disciplines, and functional areas.

As part of the DOD overarching effort, the Army has integrated Space Operations Officers into the Office of the Secretary of Defense, the Joint Staff, the Air Staff, the North American Aerospace Defense Command, the Air Force Space Command, and other space focused organizations and academic institutions. In each of these

organizations, personnel not only provide the Army perspective of space related capabilities, they articulate requirements from an operational standpoint in the joint and combined environments. A summary of the critical space capabilities provided by Army's space professionals is highlighted below.

- Army Space Support Teams: During operations, including those in Afghanistan and Iraq, the ASMDC/ARSTRAT's Army Space Support Teams continuously provide space-based products and services to combatant commanders and other international government agencies. The teams are on-the-ground space experts, pulling key commercial imagery, forecasting the impact of space weather, and providing responsive space support to their units. Just last month, 3 new teams deployed to theater to provide their capabilities for the next 9 months—60 teams have now provided invaluable on-the-ground responsive expertise to combatant commanders and the warfighter in Afghanistan and Iraq.
- Satellite Communication Support Centers: ASMDC/ARSTRAT provides and operates the DOD's Regional Satellite Communications Support Centers and Wideband Satellite Communications Operations Centers, located both in the United States and overseas. These centers are the regional management hubs for a majority of the DOD's satellite communications capabilities, providing reliable and responsive support. In close partnership with our Air Force and Navy partners, we ensure essential communications lifelines are available to our ground, air, and sea forces, as well as the diplomatic corps around the world.
- Friendly Force Tracking: Situational awareness is particularly vital given the challenges of conducting operations in urban areas. As the Army has the greatest number of warfighters and systems to track on the battlefield, our Friendly Force Tracking assets help deliver timely situational awareness and identify friendly forces during combat. In support of Operation Tomodachi, we provided the friendly force tracking architecture that enabled the U.S. Forces Japan and the U.S. Pacific Command to see its ground support elements via a common operational picture.
- Ballistic Missile Early Warning: Critical to the Joint Force Commander's theater force protection, the Army provides ballistic missile early warning and missile defense support from within the theater or region. The 1st Space Brigade's Joint Tactical Ground Stations (JTAGS) Detachments, operated by Army personnel, monitor enemy missile launch activity and other infrared events of interest and share the information with members of the air and missile defense and operational communities. Presently, our JTAGS Detachments are forward-stationed across the globe, providing assured missile warning to theater commanders and joint warfighters.
- Geospatial Intelligence Support: The Army, as an operational element of the National System for Geospatial-Intelligence, provides geospatial intelligence production in direct support of the combatant commands. The Army's space and intelligence experts perform exploitation of a variety of commercial, civil, and DOD imagery data derived from space and airborne sources. Current support includes providing imagery to U.S. Africa Command in support of contingency operations in Libya, as well as imagery and exploitation products to U.S. Pacific Command regarding the extent of damage to the Fukushima nuclear power site in Japan. Additionally, they aid in the exploration of emerging spectral system technologies and in transitioning new capabilities to the warfighter.
- Operations Reach-back Support and Services: The ASMDC/ARSTRAT Operations Center, located at Peterson Air Force Base in Colorado Springs, CO, provides reach-back support for our space experts deployed throughout the operational force and allows us to reduce our forward-deployed footprint. This center maintains constant situational awareness of deployed elements, continuously responds to requests for information, and provides the essential reach-back system of connectivity with technical subject matter experts.
- Tactical Exploitation of National Capabilities: The Army Special Program Office is the Army focal point for the exploitation of national intelligence, surveillance, and reconnaissance assets and products through the Tactical Exploitation of National Capabilities program. The Army is fully integrated into the National Reconnaissance Office and the Intelligence Community and has numerous deployed units providing support throughout the intelligence battalions and brigades.
- Strategic Space Surveillance: The Army also operates facilities and assets that are of upmost importance to advancing the Nation's use of space. The

U.S. Army Kwajalein Atoll/Reagan Test Site (RTS), located in the Marshall Islands, is a national asset that provides unique capabilities to monitor objects in deep space. The RTS maintains a vigilant watch, providing critical space situational awareness and contributing to a variety of missions.

Building Future Space Forces

The Army uses established and emerging processes to document its space-based needs and pursue Army and joint validation of its requirements. This disciplined approach helps ensure limited resources are applied where warfighter operational utility can be most effectively served. We continue to pursue and develop the necessary adaptability across the Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities (DOTMLPF) to mitigate threats and vulnerabilities while sustaining land force operations. Within the DOTMLPF combat development arena, the Army has focused tremendous efforts on the development of our space professionals. For example, the Army Space Personnel Development Office develops policies, procedures, and metrics for the Army Space Cadre and executes the life-cycle management functions of FA 40 Space Operations Officers ensuring the Army has trained personnel to meet national security space needs. Without well-trained and motivated Army soldiers and civilians, we cannot maintain our advantage on the battlefield that our Nation's space superiority affords us.

To properly train space professionals, the Army developed the Space Operations Officer Qualification Course and the Army Space Cadre Basic Course. These two courses provide the necessary foundation for the Space Cadre. The Army also leverages the high-quality space training developed and administrated by the Air Force. Finally, numerous space officers complete additional post-graduate studies at the Naval Postgraduate School, accredited civilian institutions, and training with industry. The Army is committed to growing, training, developing, tutoring, and advancing space professionals.

Researching, Developing, Testing, and Integrating Future Space Capabilities

The Army is an instrumental joint partner in addressing tomorrow's space requirements to ensure land warfare dominance. Each year, the Army plans and programs funding for space related technology research and development. Despite the current and projected resource constrained environment, the Army recognizes the need to prioritize, leverage, and invest in promising space research and development technologies. I would like to briefly highlight three technology endeavors that have potential to provide space support to the ground warfighter.

- Space and Missile Defense Command—Operational Nanosatellite Effect: To achieve enhanced capabilities for the warfighter from space, an approach that holds great promise is the deployment of constellations of very small satellites into low earth orbit. The Space and Missile Defense Command-Operational Nanosatellite Effect is an initiative to meet specific Army space related operational needs via the use of nanosatellites. The Army recently built eight, nine-pound satellites for use in a technology demonstration. The first of these nanosatellites was placed into low earth orbit last December. This marked the first launch of an Army designed and manufactured satellite in more than 50 years. The primary objective was to receive data from a ground transmitter and relay that data to a ground station. The demonstration was successful and offers evidence that the means may be available to provide the Army—the largest user of space data—with an ability to economically provide non-line of sight sensor data from non-permissive environments to remote located soldiers.
- Kestrel Eye: Kestrel Eye is an Army endeavor to manufacture a small imaging satellite that will provide near real-time, medium resolution imagery to the tactical warfighter. Since its manufacturing costs will be relatively inexpensive, Kestrel Eye may have the ability to be robustly deployed into orbit, providing a potential solution to present existing imagery needs to tactical forces. The satellite is designed for operational theater command capabilities, providing dedicated space-based support to the tactical commander. Kestrel Eye is scheduled for its initial launch in 2012.
- Vertical/Horizontal Integration of Space Technologies and Applications: We are successfully progressing in a technology demonstration to integrate space-based data into our ground forces at the tactical level. The Vertical/Horizontal Integration of Space Technologies and Applications (VISTA) provides the capability to seamlessly distribute relevant space developed products and services to all levels of Army battle command—from corps and theater needs to the specific needs of individual warfighters. The capability to

identify what specific pieces of space-developed information are relevant to individual warfighters is a key component of VISTA's support capability.

CONCLUSION

The Army is dependent upon the capabilities that space brings to the battlefield—space is the ultimate high ground. Space capabilities continue to be inextricably linked to warfighting. In present and future conflicts, we rely on and advocate for space products and services provided by the DOD, other government agencies, our allies and coalition partners, and commercial entities to shoot, move, and communicate. The Army will continue to provide trained and ready space forces and capabilities to the combatant commanders and the warfighter, build future space forces, and research, develop, test, and integrate future space capabilities. Fully integrated capabilities will provide depth, persistence, and reach capabilities for commanders at the strategic, operational, and tactical levels. Assured space systems and well-trained and experienced space professionals significantly reduce the fog, friction, and uncertainty of warfare. The Army depends on space for everything we do in our military operations. This committee's continued support is essential in enabling us to maintain and further improve our space capabilities and provide the best-trained space professionals to combatant commanders. The courageous warfighters that serve to protect the safety and welfare of our Nation deserve nothing less.

I appreciate having the opportunity to speak on these important matters and look forward to addressing any questions you or the other committee members may have. Secure the High Ground and Army Strong!

Senator NELSON. Senator Sessions, what we've done is we've started the 2-minute comments summarizing their testimonies. We have three more, so then we're open for your opening comments.

Admiral Titley.

STATEMENT OF RADM DAVID W. TITLEY, USN, OCEANOGRAPHER AND NAVIGATOR OF THE NAVY, DIRECTOR, MARITIME DOMAIN AWARENESS AND SPACE

Admiral TITLEY. Good afternoon, Mr. Chairman, Senator Sessions. I'm honored to appear before you today on behalf of our Nation's sailors to address your Navy's space activities. The Navy is critically dependent on space to meet our maritime strategy's demands for a flexible, interoperable, and secure global communications capability to support the command and control requirements of highly mobile, geographically dispersed, U.S., joint, and coalition forces.

Our Navy's interests in space include communications, ISR, positioning, navigation, timing, missile warning, and meteorology and oceanography capabilities.

The Navy expects the demand for space capabilities to grow in the future, especially in the area of space communications. Our major space contribution to the joint community is the UHF narrowband SATCOM constellation. Beginning in 2012, the new system, MUOS, will begin to replace those legacy UHF systems.

Timely delivery of MUOS is a high priority for the Navy and our fiscal year 2012 budget submission continues our investment in this vital warfighting capability.

In closing, sir, I would like to reiterate that space capabilities will continue to be critical to our Nation's success in the maritime domain. As the recently-signed Navy space strategy states: "Space provides the ultimate crow's nest for maritime operations."

Thank you, sir, and I look forward to answering any questions you or Senator Sessions may have.

Senator NELSON. Thank you.

General Hyten and then General Shelton.

STATEMENT OF MAJ. GEN. JOHN E. HYTEN, USAF, DIRECTOR, SPACE PROGRAMS, OFFICE OF THE ASSISTANT SECRETARY OF THE AIR FORCE FOR ACQUISITION

General HYTEN. Chairman Nelson, Senator Sessions, it's an honor for me to be here today representing the thousands of men and women involved in the Air Force space acquisition business. It is undeniable that the Air Force has experienced significant challenges controlling cost, schedule, and performance in our space acquisition programs over the last decade. We acknowledge this and we understand that we must improve our acquisition practices to both continue to deliver the critical capabilities our warfighters need while at the same time achieving better value for the taxpayers. Mission assurance remains fundamental to what we do, but not at any cost.

We believe we've taken important steps to recapture space acquisition excellence. We are finally finishing the development phase of many of our programs, delivering new capabilities, and moving into more stable production. We are placing new and additional emphasis on efficient space procurement that includes new acquisition strategies for acquiring space and launch vehicles included in our fiscal year 2012 budget submission.

We are working to stabilize funding requirements and personnel to ensure programs are more affordable, executable, and delivered as planned. This is hard work and it's going to take time for these changes to have measurable impact on performance. Nonetheless, we're confident that the space acquisition community is moving in the right direction and creating a fundamentally different space acquisition culture.

Again, let me express my thanks and appreciation to the members and staff of this subcommittee for your continued and dedicated support of our space capabilities. More importantly, thanks to our soldiers, sailors, airmen, and marines. I also look forward to answering your questions, sir. Thank you very much.

Senator NELSON. Thank you, General.

[The prepared statement of General Hyten follows:]

PREPARED STATEMENT BY MAJ. GEN. JOHN E. HYTEN, USAF

I. INTRODUCTION

Chairman Nelson, Senator Sessions, distinguished members of the subcommittee; I'm honored to be in front of you to discuss a challenging but exciting topic: space acquisition. I'm also honored to be with these leaders of the National Security Space Enterprise including members of other Services, displaying the inherent joint nature of space. This subcommittee oversees some of the most important aspects of our national security—nuclear weapons, ballistic missile defense, and our space programs. I want to thank you for everything that you do for our airmen and, specifically, our space cadre.

II. CHALLENGES IN SPACE ACQUISITION

It is well documented that the Air Force has experienced significant challenges controlling cost, schedule, and performance of space acquisition programs over the last decade. We were often criticized for "over reaching" on space programs. The developmental systems promised giant single-step leaps in technology, but often over ran program budgets and failed to meet requirements in a timely manner. I acknowledge these challenges as areas where the Air Force needs to improve our acquisition practices to deliver better capabilities to the warfighter while achieving better value for the taxpayer. We have not ignored these challenges; rather, we have taken important steps to recapture space acquisition excellence.

Over the last year, the Air Force made both structural and strategic changes improving space acquisition. Structurally, my Space Directorate was recently moved back under the Air Force Assistant Secretary for Acquisition better aligning space acquisition policies and programs with those of the greater Air Force. This move consolidates all Air Force programs under one Service Acquisition Executive providing better oversight of the full Air Force acquisition portfolio. The new organization also optimizes total obligation authority and allows greater funding flexibility to manage all Air Force systems. Air Force acquisition can now provide an integrated, balanced Service position toward our investments in weapon systems acquisitions.

In addition, we are placing new and additional emphasis on Efficient Space Procurement that includes new acquisition strategies for acquiring space and launch vehicles in the fiscal year 2012 PB. One element, the Evolutionary Acquisition for Space Efficiency (EASE) approach for procuring satellites employs the following key tenets: block buys of satellites, fixed-price contracting, stable research and development investment, and a modified full funding approach. Block buys and fixed-price contracts are key tenets to bring satellite unit costs down and reinvest realized savings in research and development for next generation capabilities. The modified funding approach enables affordability of the block buys by funding the satellite procurement over multiple years—specifically, under EASE, we plan to fully fund our satellite procurements by using advance appropriations. The Air Force envisions implementing the EASE approach to drive down costs, improve stability in the fragile space industrial base, and invest in advanced technology development and critical capabilities to lower risk for future programs. We appreciate the dialogue we've already had with your staff on EASE and look forward to working with the committee further, as needed.

The National Security Space enterprise couldn't reach space without our reliable launch capability. The Evolved Expendable Launch Vehicle (EELV) launch systems have a record of unparalleled success since the first launch in 2002. The Air Force recently completed the 40th consecutive successful launch of EELV, demonstrating our continuing commitment to assured access to space. In a separate and distinct acquisition strategy, the Air Force is proposing a block buy approach for the EELV program. If approved, the National Security Space enterprise would commit to block buys of at least eight launch vehicle cores per year to stabilize launch industrial base production rates and control launch cost. We will also support competition from vendors with proven capabilities. Our revised EELV acquisition strategy will include a new entrant approach that we are coordinating with the National Reconnaissance Office and National Aeronautics and Space Administration. Future competition could further drive cost savings and enhance the domestic industrial base and our operational flexibility. However, we must still closely scrutinize mission assurance practices to ensure we are safely and reliably getting our valuable space assets to orbit.

In both strategies, the Air Force is working to stabilize funding, requirements, and personnel to ensure programs are more affordable, executable, and delivered as planned. Again, we want to attain better capabilities for the warfighter while achieving better value for the taxpayer.

III. COMPLETED DEVELOPMENT AND LAUNCH OF SPACE SYSTEMS

Despite the challenges encountered in space program development, our resilient workforce has persevered ensuring the warfighter receives greater capability in key mission areas. Over the past year, we have completed development of essential, first-of-their-generation systems. Just last week, we achieved the launch of the first Space Based Infrared System (SBIRS) Geostationary Earth Orbit (GEO) satellite to enhance our Overhead Persistent Infrared capability. The SBIRS GEO system will provide improved infrared capabilities with a faster revisit scanning rate and greater sensitivity than the legacy Defense Support Program system. Moreover, with a taskable staring capability, it will provide higher fidelity and persistent coverage for areas of interest.

Last September, we launched the Space-Based Space Surveillance (SBSS) Block 10 system to enhance awareness of deep space objects of interest for safety of flight, threat detection, and warning. SBSS Block 10 significantly improves the timeliness of data on space objects in transit to deep space orbits. This satellite is currently in operation and is exceeding performance expectations, demonstrating excellent focus, high stability, and superb photometric sensitivity.

This past August, the Air Force launched the first Advanced Extremely High Frequency (AEHF) satellite. While we encountered initial issues with the propulsion system, the team revised the orbit-raising plan and has been successful in executing

this plan to achieve the required on-orbit design life. The AEHF team's dedication and resolve is a testament to government and industry space team cooperation. AEHF satellites accommodate ten times the throughput and greater than five times the data rate of the current Military Strategic and Tactical Relay II Satellite Communication System.

Finally, in May 2010, we launched the first of 12 Global Positioning Satellite (GPS) IIF satellites that will broadcast a third civil signal, in addition to legacy signals provided. These satellites will sustain a healthy, but aging, GPS constellation providing ubiquitous position, navigation, and timing capabilities for military and civil users.

IV. MODERNIZING OUR MISSION AREAS

While the Air Force provides new space capability for the joint warfighter today, we are keeping an eye on the needs of the future and developing the next generation systems to meet those requirements. For example, the GPS III program is progressing on schedule to deliver the first IIIA satellite in 2014. The next generation of GPS will deliver significant enhancements including better anti-jam capabilities, a Galileo-compatible L1C civil signal, and improved accuracy, availability and integrity. The GPS IIIA program received its Milestone C approval in January 2011, following a very successful Critical Design Review—2 months ahead of schedule. The program office is also advancing the Next Generation Control Segment and Military GPS User Equipment programs.

Regarding defense space weather, the DOD approved a plan to modify the existing National Polar-orbiting Operational Environmental Satellite System contract to procure two Defense Weather Satellite System spacecraft for the early-morning orbit, with the first launch planned for 2018. This system will replace the Defense Meteorological Satellite Program in the early-morning orbit, ensuring continuity of detailed overhead weather imagery and sensing information.

In the space situational awareness mission area, the Air Force awarded two Space Fence contracts early in 2011 for Phase A development leading to a Preliminary Design Review in early 2012. Ultimately, the Space Fence will replace the Air Force Space Surveillance System, which is rapidly becoming unsustainable. The two ground-based radar sites comprising the Space Fence will provide timely information on launch detection, maneuvers and breakups to support protection of space assets. We are also seeking international cooperation on the Space Fence program through establishment of a space situational awareness (SSA) partnership with Australia to jointly employ and operate a site in Australia. This partnership will establish a foundation for continuing nation-to-nation cooperation.

Similar to efforts on the Space Fence program, the Air Force is taking steps on international partnerships in our Wideband Global SATCOM (WGS). In addition to providing critical communications capabilities, WGS has also become the keystone for international cooperation measures in space, with our Australian allies funding WGS–6 in return for a portion of the overall bandwidth. In accordance with the National Security Space Strategy, the Air Force is pursuing other international agreements to further expand space-based communication capability through the procurement of a ninth WGS satellite.

Finally, as discussed earlier, we are proposing the EASE strategy for procurement of AEHF satellites five and six in fiscal year 2012 and SBIRS GEO satellites five and six in fiscal year 2013. These procurements will enhance our protected communications and overhead persistent infrared mission areas, respectively.

V. FUNDAMENTALLY CHANGING THE WAY WE DO BUSINESS

To effectively modernize our space systems, the Air Force must fundamentally change the way we do business in space acquisition and incorporate these changes into our strategies going forward. We have already made adjustments by adopting a "Back to Basics" approach to space system procurement, which ensures more rigorous systems engineering and program management enacted early in development and maintained throughout its lifecycle. "Back to Basics" focuses on: mission success through clear and achievable requirements; disciplined systems engineering; proven technology; and appropriate resourcing. The Air Force has also implemented the Acquisition Improvement Plan to establish an experienced, skilled, empowered, and accountable workforce, and ensure proper requirements and adequate and stable funding. Improvement of acquisition processes and training of our personnel is essential to the success of space system development.

As we incorporate these changes, it is critical that space acquisition professionals gain a better understanding of the business principles behind system development and procurement. Mission assurance is fundamental, but not at any cost. Not only

do we have a responsibility to the warfighter in achieving better capability, we also have an equal responsibility to the taxpayer in achieving better value. Striking that balance is essential to acquiring affordable systems for the future. These fundamental shifts in acquisition perspective require a considerable culture change in our space acquisition workforce. It will take time for these changes to have measured impact on performance, but I'm confident the space acquisition community is moving in the right direction.

VI. CONCLUSION

The Air Force has been, and continues to be, committed to achieving excellence in space acquisitions. Our effort in refining acquisition practices and proposing efficiency initiatives coupled with our work to modernize and recapitalize the space inventory exemplifies our dedication to supporting the Nation's national security space objectives. The Air Force fiscal year 2012 budget reflects that commitment as we seek to maintain critical space capabilities for our Nation and our warfighters.

I am grateful for the continued and dedicated support of the space capabilities we provide for this Nation and the service of each member of this committee. I look forward to answering your questions.

STATEMENT OF GEN. WILLIAM L. SHELTON, USAF, COMMANDER, AIR FORCE SPACE COMMAND

General SHELTON. Mr. Chairman, Senator Sessions, it's a true honor for me to appear before you today as the Commander of AFSPC. I'm also honored to appear with these distinguished witnesses, and I'd like to also publicly congratulate Susan Helms on her induction into the Astronaut Hall of Fame. Her people launched SBIRS last Saturday and then shortly after that she was inducted into the Hall of Fame, so all around not a bad Saturday for the Helms household. I'm fortunate to have this talented officer and role model in my command.

In AFSPC, I am privileged to lead over 46,000 Active Duty, Guard, and Reserve airmen, government civilians, and contractors who deliver space and cyberspace capabilities around the world for our Nation. AFSPC space and cyberspace capabilities are integral to the joint fight. Our professionals work extremely hard to continually ensure excellence and mission success in global combat as well as humanitarian operations, ranging from Afghanistan and Libya to Japan.

I thank the committee for your continued and steadfast support of AFSPC and the capabilities we provide for this Nation. I look forward to your questions. Thank you, sir.

[The prepared statement of General Shelton follows:]

PREPARED STATEMENT BY GEN. WILLIAM L. SHELTON, USAF

INTRODUCTION

Mr. Chairman, Senator Sessions, and distinguished members of the subcommittee, it is my honor to appear before you today as the Commander of Air Force Space Command (AFSPC).

I am privileged to lead over 46,000 Active Duty, Guard, and Reserve airmen; government civilians; and contractors delivering space and cyberspace capabilities around the world for our Nation. The men and women of AFSPC accomplish our mission at 84 worldwide locations, yet we operate in domains where borders are often indiscernible. AFSPC space and cyberspace capabilities are integral to the Joint fight and our professionals continually ensure excellence and mission success.

Based on the unique responsibilities of the Command, I have established three priorities. First, AFSPC must support the Joint fight. We are focused on supporting our deployed compatriots with our best efforts, and we will not fail them. Second, we must address space system costs and deliver capabilities on time and on budget. In a very constrained budget environment, it is essential that we drive down costs to maximize our buying power. Finally, for the purposes of organizing, training and

equipping, we must operationalize and normalize cyberspace to conduct Air Force operations. Cyberspace cuts across the spectrum of military operations; therefore, it is imperative that Airmen understand the special requirements and operational considerations of cyberspace. As the lead Air Force Major Command for cyberspace, we will continue to work with other Major Commands to ensure we have the same level of rigor which has served the Air Force well in air and space.

I look forward to a strong and mutually supportive working relationship with the subcommittee as we seek to deliver critical space and cyberspace capability to our forces. Likewise, I am committed to working with our space and cyberspace partners, including U.S. Strategic Command (STRATCOM), U.S. Cyber Command (CYBERCOM), the National Reconnaissance Office (NRO) and the National Aeronautics and Space Administration (NASA), to advance our collective interests.

MORAL OBLIGATION TO SUPPORT THE JOINT FIGHT

I strongly believe we have a moral obligation to do everything in our power to provide outstanding support to our brothers and sisters in arms who are in harm's way. Whatever we can do operationally, whatever we can procure that would make their task easier and bring them home safely, we will pursue. In that vein, AFSPC has many capabilities which are central to today's fight, and we are posturing these systems to be even more capable in the future. The President's fiscal year 2012 budget requests $12.1 billion for AFSPC to field and operate vital space systems and critical cyberspace capabilities.

Positioning, Navigation, and Timing (PNT)

As stewards of the world's "gold standard" for PNT information, AFSPC is significantly improving the Global Positioning System (GPS) for military and civilian users alike. This past January, we completed the first of a two-phased operation called "Expandable 24," the largest satellite repositioning effort in GPS program history. This operation was planned and executed under the outstanding leadership of Lieutenant Colonel Mike Manor, Captain Dan Highlander, and Captain Blake Hajovsky of the second Space Operations Squadron (SOPS) at Schriever Air Force Base (AFB), CO. Each phase repositions three satellites to optimize terrestrial coverage of the constellation for terrain-challenged environments, such as cities and the mountains and valleys of Afghanistan.

The second and final phase of this operation is already underway and it is scheduled for completion this summer.

The fiscal year 2012 budget request of $1.7 billion (Operations and Maintenance [O&M]; Research, Development, Test and Engineering [RDT&E]; Procurement; and Military Personnel [MILPERS]) also will advance PNT capability by procuring and launching upgraded satellites (GPS IIF and GPS III), funding a significant upgrade to the operational control segment (OCX) and building new Military GPS User Equipment (MGUE). GPS III, OCX and MGUE will improve user collaboration, incorporate an effects-based approach to operations and establish a net-centric ground architecture, thereby accelerating the mission application of positioning and timing information.

Last May, AFSPC launched the first of 12 GPS IIF satellites, which provides improved timing technology, a more jam-resistant military signal and a higher-powered civilian signal. Captains Vivian Elmo and Linda Gostomski, both from our GPS Reserve Associate Unit, 19 SOPS, Schriever AFB, CO, led the way as integrators of contractor, booster, satellite vehicle and ground network teams to ensure a successful launch and on-orbit checkout of this new capability.

Military Satellite Communications (MILSATCOM)

The demand for satellite communications continues to grow as warfighters increasingly depend on information relayed from space, especially for today's distributed operations in this era of information-enabled warfare. This past June, the first block of Wideband Global SATCOM (WGS) satellites became fully operational with the acceptance of WGS–3. Launches of the next block of WGS satellites (4–6) are planned for 2011–2013, with funding for WGS–6 coming from Australia. This partnership is an example of the international cooperation envisioned in the National Space Policy and National Security Space Strategy. The fiscal year 2012 request includes $481.5 million (RDT&E and Procurement) for WGS to meet combatant commander requirements to deliver voice, data, and imagery, as well as full motion video from Remotely Piloted Aircraft (RPA).

The first satellite in the next generation of protected and survivable MILSATCOM, our Advanced Extremely High Frequency (AEHF) satellite, was launched last August. Compared to its predecessor, Milstar, AEHF will soon provide a 10-fold throughput increase in secure, jam-resistant communications for national

leaders and combatant commanders, as well as support for our international partners including Canada, the Netherlands, and United Kingdom.

While the launch was perfect, a spacecraft propulsion system anomaly left AEHF–1 well short of its intended geosynchronous (GEO) orbit. A team of experts from the Space and Missile Systems Center (SMC), led by Lieutenant General Tom Sheridan and Mr. Dave Madden, developed a plan to innovatively use the remaining much smaller thrusters to save this vital asset. The team worked around the clock addressing the immediate need to conserve fuel, developing the recovery plan and demonstrating the recovery could be done safely and effectively. Thanks to the outstanding engineering and hard work of these space professionals, the AEHF–1 orbit is progressing toward geosynchronous altitude and we expect to begin initial testing later this year. The budget includes $974.5 million (RDT&E and Procurement) in fiscal year 2012 to fund AEHF.

Overhead Persistent Infrared (OPIR)

Data from the legacy Defense Support Program (DSP), as well as the highly elliptical orbit (HEO)-based Space Based Infrared System (SBIRS) sensors, provides real-time missile warning and missile defense information to national decision-makers and commanders. Last year, we provided the U.S., coalition members and our allies assured warning for over 200 missile launches and 4,500 special infrared (IR) events, a 150 percent increase over 2009. This is due, in part, to the vastly improved battlespace awareness capability of the latest HEO payloads. To further assist Geographic Combatant Commanders, and in cooperation with STRATCOM, we substantially improved our missile warning reporting criteria, thanks to the herculean efforts of Captain Christopher Castle, First Lieutenant Michael Mariner and Technical Sergeant Michael Johns of the 2d Space Warning Squadron, Buckley AFB, CO. This new criteria will provide more timely and accurate warning information to our entire force.

The 40th anniversary of the DSP was celebrated in 2010. This constellation provides outstanding service to the Nation and Captains Barry Croker and Zach Lehmann are creatively finding ways to extend the lives of these satellites. They led a team of professionals who have developed a series of new system procedures to wring every last drop of capability from these assets. The team's actions already are credited with forestalling disposal of one of these valuable satellites.

While DSP has a long history of proven strategic, operational and tactical value, we are entering the era of SBIRS GEO, the replacement for DSP. Each SBIRS GEO has a staring infrared sensor to allow detection of dimmer, faster burning missiles and more accurate missile launch and impact point predictions, as well as a scanning sensor that covers an entire hemisphere in its field of view. The fiscal year 2012 budget request includes $1.22 billion (O&M, RDT&E, Procurement and MILPERS) to continue the development of additional OPIR capability.

Operationally Responsive Space

The Operationally Responsive Space (ORS) philosophy seeks to rapidly deliver warfighter-demanded capability at reduced cost through innovative acquisition approaches with shorter timelines. Last June, TacSat-3, a hyperspectral imaging satellite, transitioned from an Air Force Research Lab experiment to a warfighter-taskable, Department of Defense (DOD)-operated, system in support of Combatant Commands (COCOMs) worldwide. TacSat-3 support of the Haitian earthquake recovery efforts and the Deepwater Horizon oil spill demonstrated the value of hyperspectral imagery, and it is now being used by COCOMs to support daily operations. Leading these efforts is Lieutenant Colonel Darren Johnson, from the Headquarters AFSPC ORS Division, who deployed to Afghanistan as Chief, International Security Assistance Force Space Operations. His experience with TacSat-3 expedited theater usage of this unique space-based imager for improved location and targeting of threats to coalition forces in harm's way.

The next ORS satellite on the horizon, currently scheduled to launch later this spring, is ORS–1 which will support U.S. Central Command's (CENTCOM) multispectral imagery needs. The fiscal year 2012 budget request includes $86.5 million (RDT&E) to develop these ORS systems.

Weather

As part of the National Polar-orbiting Operational Environmental Satellite System (NPOESS) restructure, AFSPC will support Joint forces by developing the Defense Weather Satellite System (DWSS), a fiscal year 2012 request of $444.9 million (RDT&E). The acquisition of DWSS will maximize NPOESS-developed capabilities to best preserve program schedules and reduce costs. DWSS will replace the military's weather workhorse, the Defense Meteorological Satellite Program (DMSP), now in its sixth decade. We will continue to leverage longstanding partnerships with

the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) and NASA as we develop the morning orbit satellite to accompany their Joint Polar Satellite System's afternoon orbit satellite, on which both defense and civil users rely.

Currently, DMSP is operated at the NOAA Satellite Operations Facility in Maryland with a backup control station operated by 6 SOPS, a Reserve unit at Schriever AFB, CO. This blended partnership works well for all parties. As an example, in January, an emergency situation at NOAA required activation of the backup unit. Within an hour, Major Jeremy Edwards and his crew—on hot standby—mobilized and assumed full command of all DMSP satellites, continuing delivery of critical environmental intelligence information to worldwide forces.

Space—Contested, Congested, and Competitive.

Space Situational Awareness (SSA)

As the National Security Space Strategy states, "space is becoming increasingly contested, congested and competitive." In light of these challenges to the space domain, we must maintain adequate resiliency of space capabilities to ensure space-based information delivery and access for Joint forces and allies. Foundational to our ability to "operate through" the growing threats is SSA, which is enabled by the fusion of Space Surveillance Network (SSN) sensor information at the Joint Space Operations Center (JSpOC). Behind the scenes providing this capability daily are Space Event Duty Technicians, like Staff Sergeant Adrian Cervantes, ensuring the accuracy of the SSA data by working closely with fellow space, cyber and intelligence operators. In 2010, the JSpOC routinely tracked over 22,000 space objects, an approximately 10 percent increase in objects from the previous year. Each week JSpOC conducts over 7,000 space object conjunction (collision potential) screenings which are critically important to the 23 commercial and agency partners in the SSA Sharing Program. Last year, there were 126 collision avoidance maneuvers, a 180 percent increase over 2009, the year of the very unfortunate Cosmos and Iridium satellite collision.

Our ability to maintain leadership in SSA depends on SSN modernization and adding increased SSA capability to track smaller objects, increase timeliness of revisit rates and mitigate coverage gaps. Replacing the Air Force Space Surveillance System, which employs a 1960's era Very High Frequency radar, is important to this overall objective. The Space Fence and its S-band radar capability will significantly aid the detection of smaller objects and provide uncued tracking of space objects.

Last September, the first operational launch of a Minotaur IV delivered the Space Based Surveillance System to orbit, the first dedicated on-orbit SSA satellite, which provides us the capability to track an object, day or night, without weather interference. The satellite's first image was taken in October by a team of SMC, one SOPS and seven SOPS (Reserve Associate Unit) personnel as part of planned calibration and characterization activities, and the initial data is superb. Another new potential SSN contributor is the Defense Advanced Research Projects Agency's (DARPA) Space Surveillance Telescope (SST), based in New Mexico, which is currently undergoing extensive testing. SST has the potential to provide AFSPC with new capability to detect and track faint space objects at geosynchronous distance.

Foundational to all the space surveillance architecture improvements is ensuring that we have the processing and data fusion capabilities to conduct SSA. The JSpOC Mission System, with a fiscal year 2012 budget request of $122.1 million (O&M, RDT&E, and Procurement) will replace legacy technology with improved data processing, integration, visualization and exploitation capabilities. Without the capability to receive, process, fuse, and exploit the data we receive from SSA sources, we will not meet the challenges of an increasingly congested and contested space environment.

Space Protection Program (SPP)

SPP continues to inform the national space community by raising awareness of space threats and system vulnerabilities, as well as identifying material and non-material solutions to mitigate those threats. The Air Force's fiscal year 2012 budget request is for $9.8 million (RDT&E) to continue this work to gain architectural insights for the future. Through several analytical studies, SPP provided AFSPC and NRO leadership significant recommendations and mitigation options to protect space assets. For instance, Lieutenant Colonel Gary Samson led an analysis and software demonstration activity which illustrated how some immediate operational changes could reduce the effects of known threats and regain reconnaissance mission capability. Another study, led by Lieutenant Colonel Dan Bates, provided several recommendations to sustain PNT capabilities in a contested environment. SPP's

analytical work also supports real world events, exercises and wargames. Finally, SPP supports national efforts to develop policy, strategy and architecture options across the national security space community.

Schriever Wargame 2010

The Schriever Wargame series generates leadership insights in contested space and cyberspace environments. The most recent iteration, Schriever Wargame 2010, brought together military and civilian experts from more than 30 government agencies. Under the leadership of Lieutenant Colonel Joe Wurmstein, Headquarters AFSPC Wargaming Branch Chief, and Major Jim Pedersen, the Game Director, this version focused on space and cyber deterrence, escalation control, response options, policy, planning, and national command relationships and authorities. The wargame featured expanded international and industry participation, including Australia, Canada, Great Britain, a North Atlantic Treaty Organization observer cell and cyber industry representation. As AFSPC prepares for the next iteration in 2012, we will use a comprehensive approach to gain additional insights, integrating instruments of national power to deter, prevent, and contain conflict.

Space Innovation and Development Center

The SIDC, as the name implies, is our center for space and cyber innovation. Among other responsibilities, it is home to the Air Force Tactical Exploitation of National Capabilities, which works to deliver game-changing increases in capability for the joint fight. Other Space Innovation and Development Center (SIDC) projects include on-demand commercial Synthetic Aperture Radar distribution to warfighters, distribution of fifth generation aircraft data into legacy fighter aircraft and C2 platforms, and a prototype Data Integration and Fusion Center (DIFC) capable of providing a robust common operating picture to COCOM decision-makers by fusing multiple sources of non-traditional and national level information.

X–37B

Several AFSPC organizations supported DOD's first-ever operational space plane mission, the X–37B Orbital Test Vehicle (OTV). Through lessons learned from the first flight, the SIDC's 3rd Space Experimentation Squadron has identified concepts of employment, training, education and technical skill sets required for future X–37B operations. Also crucial to this success was First Lieutenant Gordon Barnhill of the 45th Launch Support Squadron at Patrick AFB, FL, who was the launch site's lead engineer and developer of ground-breaking procedures for the launch and landing of this unique space plane. Additionally, the Western Range Team at Vandenberg AFB, CA, developed and tested new procedures for X–37B pre-recovery operations. Mr. Dennis Pakulski, the Chief Mission Engineer, applied both ingenuity and experience to replace 658 steel runway plates that posed a danger to the X–37's landing gear. Captain Dariusz Wudarzewski, the Range Operations Commander, led more than 250 landing team members and provided the complex final recommendation for "clear to land" for the safe return of the OTV after nearly 8 months of successful on-orbit operations. The second launch of the X–37B took place March 5.

Air Force Satellite Control Network (AFSCN)

The AFSCN is our capability to receive mission data and control many of our Nation's satellites. In fiscal year 2010, the AFSCN conducted over 150,000 satellite contacts, supported 21 launches and 39 vehicle emergencies. The fiscal year 2012 budget requests $328 million (O&M, RDT&E and Procurement) for AFSCN. The AFSCN recently underwent a major upgrade, replacing decades-old communication and switching equipment, and upgrading communication circuits to handle Internet Protocol traffic. Considerable downtime over a 4-day period was required to make these changes. First Lieutenant David Rothzeid of SMC's Satellite Control and Network Systems Division orchestrated the outages site-by-site, working with multiple organizations and contractors to ensure the network could maintain its average 450 per day satellite contact rate during the transition.

Electromagnetic Spectrum Management

In 2010, the Air Force Frequency Management Agency, Alexandria, VA, was redesignated the Air Force Spectrum Management Office (AFSMO) to better reflect the broader responsibilities of that organization. Colonel Brian Jordan, the AFSMO Commander, is the strategic thinker and visionary dealing with the difficult challenges that accompany preserving access for essential Air Force capabilities. The backbone of information flow is the electromagnetic spectrum which is the common link among networks, sensors, weapon systems, commanders and combat forces. In the Presidential Memorandum, Unleashing the Wireless Broadband Revolution,

issued on June 28, 2010, Federal agencies were directed to cooperate in the effort to locate 500 megahertz of Federal and non-Federal spectrum suitable for wireless broadband use. As a result of the memorandum and at the direction of the Department of Commerce's National Telecommunications and Information Administration, AFSMO will lead the Air Force's evaluation of the 1755–1850 megahertz spectrum sought by wireless companies to determine if it can be made available without harming critical capabilities.

This spectrum is used by a wide array of critical Air Force systems, including precision guided munitions, airborne telemetry systems, RPAs and the C2 of numerous satellite systems, including GPS. As the Air Force designs, tests and deploys new or modified systems, spectrum management is of paramount importance to supporting the joint fight.

Silent Sentry

Since 2005, Operation Silent Sentry, a capability initially designed for a 120-day demonstration, has provided CENTCOM with spectrum monitoring for electromagnetic interference (EMI) of satellite communications in the AOR. Spearheaded by personnel from the 16th Space Control Squadron (SPCS), Peterson AFB, CO, and its collocated Reserve Associate 380 SPCS, this nine-person team is instrumental in detecting and geo-locating sources of EMI events—both intentional and unintentional—including monitoring of RPA satellite links used for C2 and mission data. The current deployment team is led by Lieutenant Colonel Blake Jeffries (16 SPCS) and Master Sergeant Scott Westfall (380 SPCS).

In-Theater Space Professionals

Many of our space professionals have deployed to critical positions in the CENTCOM Area of Responsibility (AOR) to ensure timely space support is available to the warfighter. Included in this group is the Director of Space Forces (DIRSPACEFOR). The DIRSPACEFOR, currently Colonel Dave Buck, brings senior-level space perspective and harnesses the expertise of our mid-level space professionals who are integrated in theater units, directly supporting Joint and coalition forces. Additionally, the DIRSPACEFOR reaches back to the Joint Functional Component Command for Space and the JSpOC at Vandenberg AFB, CA, for access to all DOD space forces.

Captains Aaron Cochran and Peter Norsky are just two examples of these mid-level theater space professionals, in this case assigned to the 504th Expeditionary Air Support Operations Group. They provide critical forward-based space expertise enabling integration of space capabilities into air and ground operations in Kandahar and Mazar-e-Sharif, Afghanistan. Their presence allows expert knowledge transfer to tactical users, including Army brigades and battalions, Joint Terminal Attack Controllers and other battlespace owners.

Space and Cyberspace Capabilities at Red Flag

Another milestone for AFSPC is tactical level integration of space and cyber capabilities with traditional air capabilities at the Air Force's premier training exercise, Red Flag, held at Nellis AFB, NV. Recently, a space officer was designated the overall mission commander during one of the exercise days—a Red Flag first. Captain Warren Riner, 76th SPCS, Peterson AFB, CO, led a multi-faceted air, space and cyberspace force, which highlighted the diverse, yet synergistic, mission capabilities of the Air Force. Captain Riner's team was also responsible for all air, space and cyberspace nonkinetic capability integration during all exercise missions. I believe this is the future of our force: seamless integration of multiple capabilities, where the result is greater than the sum of the parts.

CONTROL SPACE SYSTEM COSTS

AFSPC is implementing significant changes as part of the Air Force's "Recapture Acquisition Excellence" priority. From requirements definition to contracting to hard-nosed program management, we must work to reduce our space system acquisition costs. In cooperation with the Office of the Secretary of Defense, the Air Force is redefining acquisition strategies for buying military satellites. Anticipated savings will allow for research and development investment for future performance improvements and to lower cost of follow-on systems. We will closely collaborate with the Headquarters Air Force acquisition staff to implement this new strategy for the next blocks of AEHF and SBIRS satellites. We look forward to working with Congress to obtain the necessary legislative authorities to execute this strategy and achieve our vision.

The record of successful national security launches since 1999 is truly remarkable. Nevertheless, we treat each launch as if it were our first, applying sound mission

assurance principles to ensure success. Unfortunately, the space launch industrial base is very fragile, resulting in significantly increased costs of the Evolved Expendable Launch Vehicle (EELV) program. To arrest this cost growth, we are implementing a new launch vehicle purchasing strategy. Our plan is to commit to an annual production rate of launch vehicles, alongside the NRO, with block buy procurement. We believe this will provide predictability, economic order quantity opportunities and a more stable industrial base, thereby lowering overall costs. A team of acquisition and launch experts, including NRO, NASA, and industry partners, is developing an improved approach to maintaining EELV's outstanding mission success record while controlling costs and providing more operational flexibility. The Air Force request for EELV is $1.76 billion (RDT&E and Procurement) in fiscal year 2012.

A Letter of Intent and Memorandum of Understanding signed by the Air Force, NASA and the NRO commits the organizations to closer coordination in the acquisition of launch vehicles, liquid-fueled engines for boosters and upper stages, and the development of launch bases and ranges. This is recognition of the continued need for collaboration to help assure the Nation's access to space, especially in a challenging fiscal environment for all the agencies involved.

OPERATIONALIZE AND NORMALIZE CYBERSPACE FOR AIR FORCE OPERATIONS

As the Air Force's lead Major Command for cyberspace, AFSPC is making significant strides in leveraging existing resources, applying appropriate lessons learned and new processes, and working toward increasing our effectiveness within cyberspace for 21st century military operations. Using this approach, we have rapidly developed the organizational structure, C2, career field management, education and training, and technical capabilities in cyberspace. Last October, Twenty-Fourth Air Force (24 AF) achieved Full Operational Capability status and in December was designated Air Forces Cyber to signify its role as the Air Force's operational component to CYBERCOM.

We are applying lessons learned from the Space Professional Development Program to build a counterpart cyberspace program. The focus of the Cyberspace Professional Development Program is to build 21st century cyberspace warriors with a mindset and skill set tailored to operational roles. Last year, we produced our first graduates from Undergraduate Cyberspace Training, Cyber 200 and Cyber 300 classes, forming the beginnings of a highly trained cyber force.

Cyberspace integration into the Joint fight is beginning to take shape. A recent milestone was the integration of RPA mission assurance efforts, also called "cyber escort missions," into the operations section of the CENTCOM Air Tasking Order. This signifies the first major, sustained employment of cyber capability into day-to-day air operations. Lieutenant Colonel Gerald Ramsey, who is assigned to the 624th Operations Center, Lackland AFB, TX, currently leads one of the first deployments of the Cyberspace Operations Liaison Element (COLE) to the CENTCOM AOR. The COLE ensures cyber effects are fully integrated into contingency planning efforts from initial planning through execution. The COLE also provides mission assurance, exercise planning and development, and cyber intelligence support to joint operations.

Our 689th Combat Communications Wing (689 CCW) already is fully integrated in warfighter support. Last year, the 689 CCW deployed 700 Airmen to 54 locations, highlighted by establishing initial communications capability on four bare bases in hostile areas. Additionally, they provided support to homeland defense and disaster relief efforts, including Secret Service support and crucial involvement in humanitarian and disaster relief operations in Haiti and Chile. Staff Sergeant Alexander Yessayan, a combat communication specialist, received the Air Force Combat Action Medal and Army Combat Action Badge for his heroic actions in defending his Provincial Reconstruction Team against a Taliban ambush while in Afghanistan. Major Noland Greene, Commander of the 34th Combat Communications Squadron, led a 47-member team of cyber warriors to Shindand Air Base, Afghanistan, where they built and operated a network that provided all required communication services for the Army at this forward operating base.

While AFSPC and 24 AF have swiftly reached significant cyberspace milestones, much work remains. Our top priority is to consolidate into a single Air Force network. This single network will be a major step toward achieving real-time situational awareness, allowing better defense of the network, and facilitating efficient enterprise solutions for the Air Force. This will standardize and simplify delivery of services to our force, thereby reducing operations and maintenance costs.

In addition to terrestrial network consolidation, the Air Force Network Integration Center leads the Single Integrated Network Environment (SINE) initiative.

Under the leadership of Lieutenant Colonel Patrick Dunnells, SINE is an overarching framework for how the Air Force will provide seamless information flow across terrestrial, air and space domains. Information flow among domains is critical for efficient and effective mission accomplishment and SINE is a path forward to provide resilient, risk-mitigated infrastructure for increased operational reliability, availability, C2 and situational awareness.

AFSPC's cyberspace portfolio request is for $1.9 billion in fiscal year 2012. Approximately $1.2 billion of this request is for operations and maintenance and over $700 million is allocated for developing additional capability. Operationalizing and normalizing the cyberspace mission for the Air Force is in its nascent stages, but beginning to take root as we build a strong foundation

with deliberate speed and thought. These efforts will enhance the asymmetric advantages of our Joint forces and provide the vehicle for synergistic benefits through integration of air, space and cyberspace.

AFSPC PROFESSIONALS

The talented men and women of AFSPC and the families who support them are essential to achieving the Command's three priorities. We have trained and ready Airmen who deliver for the joint fight every single day in technically demanding domains. I strongly believe the continued development of our space and cyberspace professionals is key to our future. Last year we broke ground on the new $14.4 million Space Education and Training Center, which will give a permanent, on-base residence for the National Security Space Institute (NSSI) and Advanced Space Operations School (ASOpS). Each year, ASOpS provides advanced training to more than 1,600 DOD space professionals, while NSSI, the Air Force's space professional development school, provides unique education to approximately 800 space professionals from all Services. Again in compliance with the new National Space Policy, this year the NSSI will provide its first course offerings to our Australian, British and Canadian international partners.

In addition to the training we provide for our people, a professional, non-discriminatory environment creates the opportunity for all to achieve their full potential. We steadfastly support the Air Force's Sexual Assault Prevention and Response program and its role in fostering a healthy unit environment. AFSPC is proud of our bystander intervention video, shared AF wide, which captures the experience of Airman First Class Edward Todd of the 21st Dental Squadron, Peterson AFB, CO. The video recreates how he applied his training to assist a young woman in a dangerous situation, averting a potential assault. Further, I believe a focus on the resiliency of our people is foundational to developing a wellness culture that combats not only suicides, but alcohol and substance abuse, and other self-destructive behaviors. We are working hard to provide education and training to raise the resiliency of our entire command, thereby providing better tools to our people as they deal with the stressors of daily life.

Total Force Enterprise

The contributions of our Reserve and Guard forces to the Joint fight simply cannot be overstated. In AFSPC, the Air Reserve Component (ARC) comprises approximately 40 percent of our Airmen. Space and cyberspace operations require high-caliber individuals with in-depth technical skills. As many AFSPC missions are 24x7 and deployed-in-place, the ARC can augment active duty units as part-time force multipliers providing needed technical expertise, especially in cyber where industry is currently leading innovation. The ARC enables a superb intersection of military and civilian experience, which is mutually beneficial to both active duty and ARC Airmen in our Command.

CONCLUSION

Significant technological advances in space and cyberspace have transformed the way we conduct military operations—and even the way we live our daily lives. Recognizing the mandate to keep pace with this high rate of change, AFSPC will proceed with a sense of urgency as we deliver global capabilities, which are so crucial in this age of information-enabled warfare. We will focus on our three priorities: support the joint fight, get control of the costs of space programs, and operationalize and normalize cyberspace for Air Force operations. Above all, our workforce of highly trained and motivated professionals will continue to produce excellence, global and beyond.

I consider it a deep personal honor to command AFSPC, and again, I appreciate the opportunity to appear before the subcommittee to represent my Command.

Senator NELSON. Thank you, General.

Ms. Chaplain.

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

Ms. CHAPLAIN. Thank you, Mr. Chairman. Our focus at GAO is on acquisition oversight. If I have to sum up my remarks very quickly, I would just say that space acquisition has been broken, it is being fixed, but more needs to be done. I just want to spend a few minutes telling you what's on our watch list in terms of what needs to be done. I want to say that a lot of credit should go to both the Air Force and DOD for the actions they have been taking, and they are all detailed in our statement.

First, there are some major programs that face considerable schedule pressures and schedule risks. Although they are attempting to incorporate best practices, it's still unknown at this time the extent that these practices can shorten the schedules by years.

Second, many of the systems on the ground that support space activities and that enable satellite capabilities to be used, are still facing a high degree of acquisition risk. These include ground systems like the operational control segment (OCX) program for GPS, user terminals for the AEHF system, some of the sensors involved with space situational awareness, and the control system for space situational awareness, known as the JSpOC mission system (JMS), which is the linchpin in that mission and it's very critical that it be done successfully.

Third, while there's been a number of organizational changes made over the past year, it's just unclear at this point how they'll shake out and whether they'll really streamline oversight and strengthen it for space acquisitions.

Fourth, there's more organizations involved in space now. You have the Missile Defense Agency (MDA) taking on a new major program, the Army is taking on some space efforts, and you need to balance this with the dwindling workforce. There's key areas of space expertise that have been decreasing in recent years. There's a question as to how we have that capability, is it being stretched too far across DOD.

Lastly, there's just budget pressures that we all know are out there. At the same time, space is very costly. The question going forward is: can we still start new major efforts or is that going to be unaffordable? When we do start them, are we going to be pressured to take shortcuts, including testing and important mission assurance activities?

That's just what's on our list for this year. I thank you.

[The prepared statement of Ms. Chaplain follows:]

PREPARED STATEMENT BY CRISTINA T. CHAPLAIN

Chairman Nelson, Ranking Member Sessions, and members of the subcommittee:

I am pleased to be here today to discuss the Department of Defense's (DOD) space acquisitions. Each year, DOD spends billions of dollars to acquire space-based capabilities to support current military and other government operations, as well as to enable DOD to transform the way it collects and disseminates information. Despite the significant investment in space, the majority of large-scale acquisition programs in DOD's space portfolio have experienced problems during the past two decades that have driven up costs by hundreds of millions and even billions of dollars, stretched schedules by years, and increased technical risks. To address the cost in-

creases, DOD altered its acquisitions by reducing the number of satellites it intended to buy, reducing the capabilities of the satellites, or terminating major space system acquisitions. Moreover, along with the cost increases, many space acquisitions have experienced significant schedule delays—of as much as 9 years—resulting in potential capability gaps in areas such as missile warning, military communications, and weather monitoring. These problems persist; however, the Air Force and the Office of the Secretary of Defense have taken a wide range of actions to prevent them from occurring in new programs.

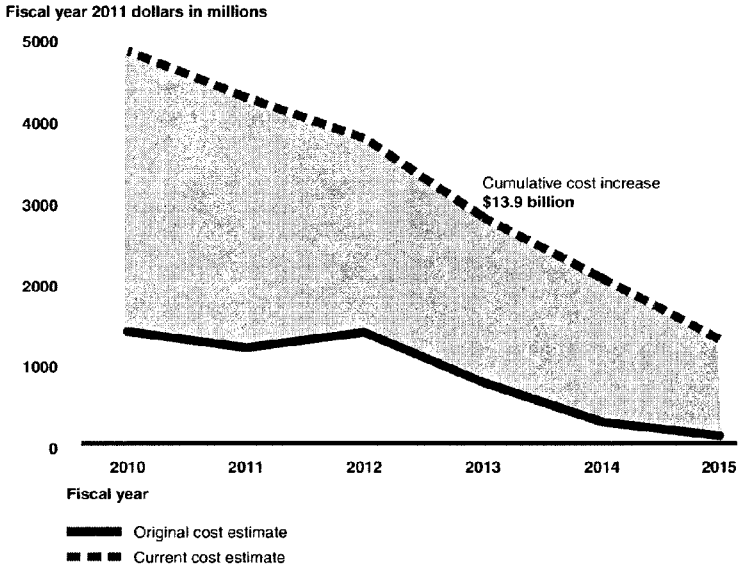
My testimony today will focus on: (1) the status of space system acquisitions, (2) results of our space-related reviews over the past year and the challenges they signify, (3) the efforts DOD has taken to address causes of problems and increase credibility and success in its space system acquisitions as well as efforts currently underway, and (4) what remains to be done. Notably, DOD has acknowledged the acquisition problems of the past and recognizes the need for better management of the acquisition process and oversight of its contractors. More important, several high-risk space programs appear to have finally resolved technical and other obstacles and have started to or are close to beginning to deliver capability. However, other space acquisition programs—including the Global Positioning System (GPS) IIIA and Mobile User Objective System (MUOS)—continue to face challenges in meeting their cost and schedule targets and aligning the delivery of space assets with the ground and user systems needed to support and take advantage of new capability. Moreover, it may take years for acquisition improvements to take root and produce benefits that will enable DOD to realize a better return on its investment in space. Importantly, DOD has taken steps to decide how to best organize, lead, and support space activities. But more may be needed in light of the wide range of stakeholders and past issues with diffuse leadership.

The work that supports this statement was performed in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. Additional details on our scope and methodology are provided in appendix II.

STATUS OF SPACE ACQUISITIONS: CHALLENGES PERSIST

A longstanding problem in DOD space acquisitions is that program and unit costs tend to go up significantly from initial cost estimates, while in some cases the capability that was to be delivered goes down. Figure 1 compares original cost estimates and current cost estimates for the broader portfolio of major space acquisitions for fiscal years 2010 through 2015. The wider the gap between original and current estimates, the fewer dollars DOD has available to invest in new programs. As shown in the figure, cumulative estimated costs for the major space acquisition programs have increased by about $13.9 billion from initial estimates for fiscal years 2010 through 2015, almost a 286 percent increase. The declining investment in the later years is the result of mature programs that have planned lower out-year funding, cancellation of several development efforts, and the exclusion of space acquisition efforts for which total cost data were unavailable (such as new investments).

Figure 1: Comparison between Original Cost Estimates and Current Cost Estimates for Selected Major Space Acquisition Programs for Fiscal Years 2010 through 2015

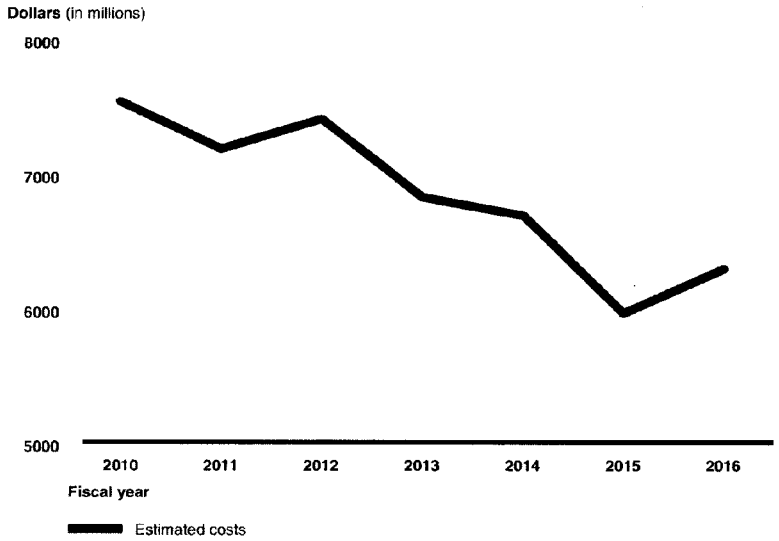


Source: GAO analysis of DOD data.

Note: Includes Advanced Extremely High Frequency, Global Broadcast System, Global Positioning System II and III, Mobile User Objective System, Space Based Infrared System High, and Wideband Global SATCOM. Does not include the Evolved Expendable Launch Vehicle (which is in sustainment) and planned new space acquisition efforts—such as Defense Weather Satellite System, Joint Space Operations Center Mission System, Space Based Space Surveillance Follow-on, and Space Fence—for which total cost data were unavailable.

When space system investments other than established acquisition programs of record—such as the Defense Weather Satellite System (DWSS) and Space Fence programs—are also considered, DOD's space acquisition investments remain significant through fiscal year 2016, as shown in figure 2. Although estimated costs for selected space acquisition programs decrease 21 percent between fiscal years 2010 and 2015, they start to increase in fiscal year 2016. According to current DOD estimates, costs for two programs—Advanced Extremely High Frequency (AEHF) and Space Based Infrared System (SBIRS) High—are expected to significantly increase in fiscal years 2017 and 2018. The costs are associated with the procurement of additional blocks of satellites and are not included in the figure because they have not yet been reported or quantified.

Figure 2: Estimated Costs for Selected DOD Space Programs for Fiscal Years 2010 through 2016

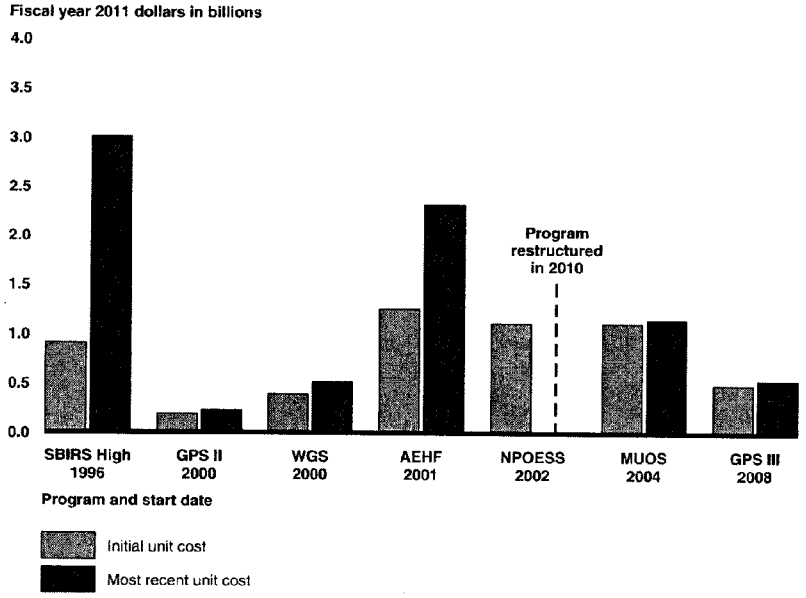


Source: GAO analysis of DOD data.

Note: The acquisition efforts include Advanced Extremely High Frequency, Evolved Expendable Launch Vehicle, Global Broadcast Service, Global Positioning System II, Global Positioning System III, Joint Space Operations Center Mission System, Mobile User Objective System, National Polar-orbiting Operational Environmental Satellite System/Defense Weather Satellite System, Precision Tracking Space System, Space Based Infrared System High, Space Situational Awareness Systems, Space Tracking and Surveillance System, and Wideband Global SATCOM.

Figures 3 and 4 reflect differences in total program and unit costs for satellites from the time the programs officially began to their most recent cost estimates. As figure 4 shows, in several cases, DOD has increased the number of satellites. The figures reflect total program cost estimates developed in fiscal year 2010.

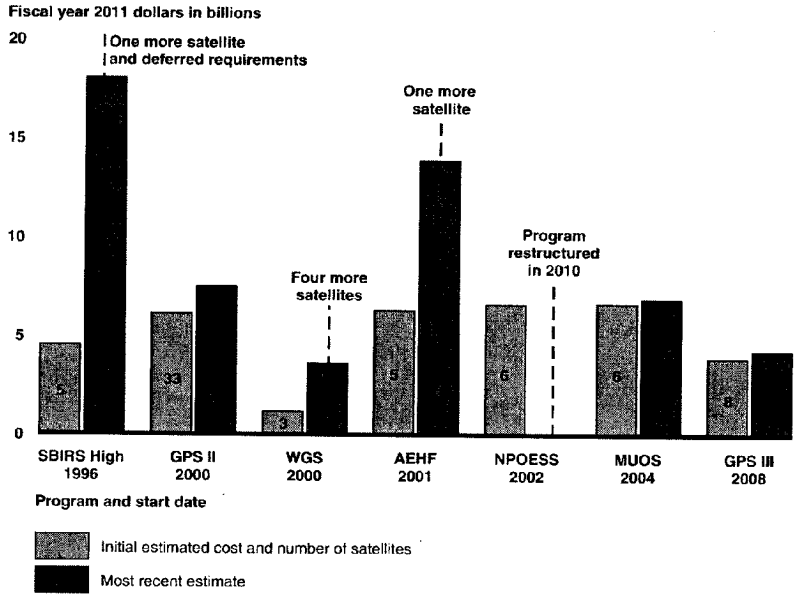
Figure 3: Differences in Unit Costs from Program Start and Most Recent Estimates



Source: GAO analysis of DOD data.

Legend: SBIRS = Space Based Infrared System High; GPS = Global Positioning System; WGS = Wideband Global SATCOM; AEHF = Advanced Extremely High Frequency; NPOESS = National Polar-orbiting Operational Environmental Satellite System; MUOS = Mobile User Objective System.

Figure 4: Differences in Total Costs from Program Start to Most Recent Estimates

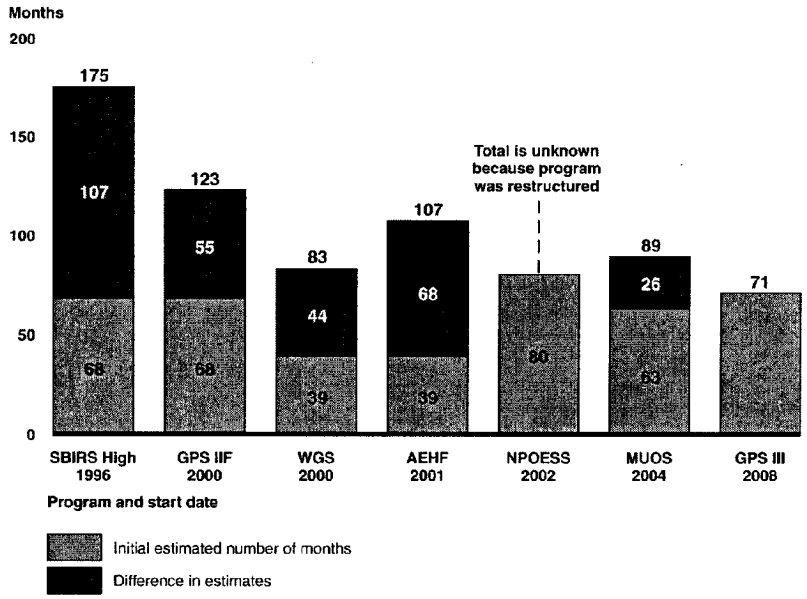


Source: GAO analysis of DOD data.

Legend: SBIRS = Space Based Infrared System High; GPS = Global Positioning System; WGS = Wideband Global SATCOM; AEHF = Advanced Extremely High Frequency; NPOESS = National Polar-orbiting Operational Environmental Satellite System; MUOS = Mobile User Objective System.

Several space acquisition programs are years behind schedule. Figure 5 highlights the additional estimated months needed for programs to launch their first satellites. These additional months represent time not anticipated at the programs' start dates. Generally, the further schedules slip, the more DOD is at risk of not sustaining current capabilities. For example, delays in launching the first MUOS satellite have placed DOD's ultra high frequency communications capabilities at risk of falling below the required availability level.

Figure 5: Total Number of Estimated or Actual Months from Program Start to Initial Launch



Source: GAO analysis of DOD data.

Legend: SBIRS = Space Based Infrared System High; GPS = Global Positioning System; WGS = Wideband Global SATCOM; AEHF = Advanced Extremely High Frequency; NPOESS = National Polar-orbiting Operational Environmental Satellite System; MUOS = Mobile User Objective System.

Some Acquisition Programs Appear to Have Overcome Problems, but Other Programs Still Susceptible to Cost and Schedule Overruns

DOD had longstanding difficulties on nearly every space acquisition program, struggling for years with cost and schedule growth, technical or design problems, as well as oversight and management weaknesses. However, to its credit, it continues to make progress on several of its high-risk space programs, and is expecting to deliver significant advances in capability as a result. The Missile Defense Agency's (MDA) Space Tracking and Surveillance System (STSS) demonstration satellites were launched in September 2009. Additionally, DOD launched its first GPS IIF satellite in May 2010 and plans to launch the second IIF satellite in June 2011—later than planned, partially because of system-level problems identified during testing. It also launched the first AEHF satellite in August 2010—although it has not yet reached its final planned orbit because of an anomaly with the satellite's propulsion system—and launched the Space Based Space Surveillance (SBSS) Block 10 satellite in September 2010. DOD is scheduled to launch a fourth Wideband Global SATCOM (WGS) satellite broadening communications capability available to warfighters—in late 2011, and a fifth WGS satellite in early 2012. The Evolved Expendable Launch Vehicle (EELV) program had its 41st consecutive successful operational launch in May of this year.

One program that appears to have recently overcome remaining technical problems is the SBIRS High satellite program. The first of six geosynchronous earth-orbiting (GEO) satellites (two highly elliptical orbit sensors have already been launched) was launched in May 2011 and is expected to continue the missile warning mission with sensors that are more capable than the satellites currently on orbit. Total cost for the SBIRS High program is currently estimated at over $18 bil-

lion for six GEO satellites,[1] representing a program unit cost of over $3 billion, about 233 percent more than the original unit cost estimate. Additionally, the launch of the first GEO satellite represents a delay of approximately 9 years. The reasons for the delay include poor government oversight of the contractor, unanticipated technical complexities, and rework. The program office is working to rebaseline the SBIRS High contract cost and schedule estimates for the sixth time. Because of the problems on SBIRS High, in 2007, DOD began a follow-on system effort, which was known as Third Generation Infrared Surveillance (3GIRS), to run in parallel with the SBIRS High program. DOD canceled the 3GIRS effort in fiscal year 2011, but plans to continue providing funds under the SBIRS High program for one of the 3GIRS infrared demonstrations.

While DOD is having success in readying some satellites for launch, other space acquisition programs face challenges that could further increase cost and delay delivery targets. The programs that may be susceptible to cost and schedule challenges include MUOS and the GPS IIIA program. Delays in the MUOS program have resulted in critical potential capability gaps for military and other government users. The GPS IIIA program was planned with an eye toward avoiding problems that plagued the GPS IIF program and it incorporated many of the best practices recommended by GAO, but the schedule leaves little room for potential problems and there is a risk that the ground system needed to operate the satellites will not be ready when the first satellite is launched. Additionally, the National Polar-orbiting Operational Environmental Satellite System (NPOESS) was restructured as a result of poor program performance and cost overruns, which caused schedule delays. These delays have resulted in a potential capability gap for weather and environmental monitoring. Furthermore, new space system acquisition efforts getting underway—including the Air Force's Joint Space Operations Center Mission System (JMS) and Space Fence, and MDA's Precision Tracking and Surveillance System (PTSS)—face potential development challenges and risks, but it is too early to tell how significant they may be to meeting cost, schedule, and performance goals.

Table 1 describes the status of these efforts in more detail.

[1] The $18 billion does not include the cost of two replenishment sensors, which the Air Force does not include as part of the SBIRS High baseline.

Table 1: Status of Major Space Acquisition Efforts

Systems achieving or nearing launch that have overcome technical and other problems	
GPS IIF (positioning, navigation, and timing)	The first GPS IIF satellite, launched in May 2010, is designed to upgrade timing and navigation accuracy and add a new signal for civilian use. The satellite was delayed over 4 1/2 years from its original launch date mostly because of development challenges. The cost of the GPS IIF program is expected to be about $1.6 billion—about $870 million over the original cost estimate of $729 million. (This approximately 119 percent cost increase is not apparent in figs. 3 and 4 because the GPS II modernization program includes the development and procurement of 33 satellites, only 12 of which are IIF satellites.) As a result of continued technical challenges in producing the GPS IIF satellites, the program continues to experience schedule delays as well as increased funding shortfalls.
AEHF (communications)	The first AEHF satellite launched in August 2010. AEHF satellites are expected to deliver 10 times the communications bandwidth that is available today for secure and protected communications. The launch of the first satellite slipped almost 6 years. The program has decided that the design specifications for the first three satellites will remain unchanged for satellites four through six, which will thus be clones except for the replacement of obsolete parts. The initial operational capability date is currently unknown because of an anomaly in the propulsion system of the first satellite, which has delayed it from reaching its planned orbit—it is expected to reach final orbit in August 2011. The program office will delay the launch of the second AEHF satellite until (1) it is cleared for flight in light of the first AEHF propulsion system anomaly and (2) the first satellite is on orbit and tested. The third AEHF satellite is expected to launch about 8 months after the second satellite is launched. The notional launch dates for satellites four through six are 2017, 2018, and 2020, respectively. The Air Force is in the process of developing a new acquisition program baseline that includes these satellites.
SBSS (space situational awareness)	The first SBSS Block 10 satellite launched in September 2010 and is expected to provide greatly improved space situational awareness to help better understand location and mission capabilities of all satellites and other objects in space. The satellite launched more than 3 years later than originally planned—in part because of launch vehicle issues unrelated to the satellite. The program was restructured in 2006 after an independent review found that the requirements were overstated and its cost and schedule targets could not be met. Efforts to develop a follow-on system have been discontinued, pending an ongoing study directed by the Office of the Secretary of Defense.
Programs still susceptible to cost and schedule overruns	
NPOESS/DWSS (climate and weather monitoring)	In February 2010, the Executive Office of the President announced a restructure of the NPOESS program, directing the acquisition and development of separate military and civil weather satellite programs. The NPOESS program had continued to experience technical problems resulting in further cost and schedule increases. The Air Force plans to acquire the DWSS to satisfy military weather requirements, and the National Oceanographic and Atmospheric Administration will acquire the Joint Polar Satellite System and a shared common ground system to address civil weather and environmental requirements. The DWSS program is expected to satisfy environmental monitoring requirements in the early morning orbit by developing and launching two satellites, with an initial launch capability no earlier than 2018.
MUOS (communications)	The MUOS communications satellite program now estimates a 26-month delay—from March 2010 to May 2012—in the delivery of on-orbit capability from the first satellite. Design issues with ultra high frequency (UHF) reflectors continue to pose cost and schedule risks for the program. In July 2009, a Navy-initiated review of the program found that while the technical challenges the program was experiencing could be solved, the MUOS budget was inadequate and its schedule was optimistic. As a result, the program developed new cost and schedule baselines. The acquisition program baseline has been under revision since December 2009, but has not yet been approved. According to the program, the prime contract cost baseline, which includes $162 million in engineering change proposals, has increased about 61 percent since contract award in September 2004. The importance of the first MUOS launch increased because of the unexpected failure of two legacy satellites. The MUOS program office is addressing the potential capability gap by activating dual digital receiver unit operations on a legacy satellite, examining the potential of purchasing or leasing commercial UHF satellite communications services, and examining the feasibility of expanded digital receiver unit operations on the legacy payloads of the MUOS satellites.

GPS III (positioning, navigation, and timing)	While the GPS III program has been structured by the Air Force to prevent the mistakes made on the IIF program, the Air Force aims to deliver the GPS IIIA satellites 3 years faster than it did the IIF satellites. According to Air Force officials, the IIIA contractor retained some of its workforce from the IIR-M program and plans to incorporate a previously developed satellite bus—efforts that reduce program risk. Also, the program has taken measures to maintain stable requirements, use mature technologies, and provide more contractor oversight. However, we continue to believe that the IIIA schedule is optimistic given the program's late start, past trends in space acquisitions, and challenges facing the new contractor. According to our analysis of data contained in selected acquisition reports for the GPS IIIA program, total program costs have increased about 10 percent over the original estimate established for the start of product development. According to the Air Force, the increase is due in part to unanticipated costs resulting from issues such as technical complexities involved in developing the satellite vehicle bus and software development. To increase confidence in the schedule for delivering the ground control system for IIIA (the next generation operational control segment known as OCX), the GPS Directorate added 16 months of development time to the effort. This means that the first block of OCX is now scheduled to be fielded in August 2015, 15 months after the May 2014 planned launch of the first GPS IIIA satellite. To address this issue, the GPS Directorate is considering funding a parallel effort that accelerates existing launch and checkout requirements to develop a command and control capability for the first GPS IIIA satellites. However, GPS Directorate officials indicated that the effort would not enable the utilization of new capabilities offered by GPA IIIA satellites, including a military signal designed to enable resistance to jamming and three civil signals.
Development initiatives getting under way	
JMS (space situational awareness)	GAO's best practices work has shown that large system projects divided into a series of smaller incremental acquisition efforts—made on the basis of reliable analysis of estimated costs, expected benefits, and anticipated risks—permits informed investment decision making. However, our ongoing work has shown that the JMS acquisition was not adopting an incremental approach—the effort instead consisted of a single increment delivered in a series of releases—as exemplified by its plans to proceed without knowledge of all critical technologies and deferral of other planning activities. This lack of knowledge could result in unanticipated costs and other programmatic risks to the acquisition effort. Although our best practices work and DOD guidance call for critical technologies to be identified and matured by development start,[a] the JMS program did not plan to identify and assess the maturity of all critical technologies by that time. Instead, JMS plans were to identify and assess critical technologies prior to each release. Consequently, the program would not have assurance that the needed technologies will be mature when needed and that cost estimates—based on the development of all releases—were reliable.[b] Additionally, JMS and DOD officials pointed to data integration issues as one of the top risks for the JMS program. More specifically, JMS will need to integrate data from numerous heterogeneous sources, many of which are not net-centric. To ensure that the data from these sources are compatible, the Air Force is currently working to ensure that these sources are net-centric before JMS is complete. Furthermore, our best practices work has shown that maturing technology to technology readiness level (TRL) 7 prior to development start reduces risk to meeting cost, schedule, and performance goals.[c] However, the JMS program planned to use technologies, such as service information exchange capabilities to allow applications to send data and information to other applications and servers, that only have been matured to TRL 6 or greater prior to the start of development for each release. A recent independent program assessment commissioned by the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics (AT&L) has prompted the Air Force to revise the JMS acquisition strategy, which may help to address the above challenges and risks.

Space Fence (space situational awareness)	The primary Space Fence risk, according to the Electronic Systems Center, is that JMS will need to be available to process Space Fence data, as the amount of data provided will result in an increase in uncued detection and tracking capacity from 10,000 to 100,000 objects. Additionally, the Space Fence program office stated other risks of the development effort include large-scale integration and calibration of radar arrays, scalability of the design for the digital beam former,[f] and development of information assurance certification criteria. Furthermore, all five critical Space Fence technologies identified by the program office are immature—one at TRL 4 and four at TRL 5—which increases risk to cost and schedule goals. Given that technology discovery cannot be scheduled, the immature technologies raise the risk of having to defer product development until these technologies become mature. Although mature backup critical technologies exist—which could be used if the primary technologies do not mature by the start of system development—all have potentially higher acquisition costs and in some cases higher operating costs as well, according to the program office. While the program has a critical technology maturity goal of TRL 6 prior to preliminary design review (which is in accordance with DOD's acquisition policy),[g] our best practices work has shown technology development to TRL 7 could significantly reduce risk to meeting cost, schedule, and performance goals.
PTSS (ballistic missile defense)	In alignment with GAO best practices, MDA plans to build two prototype satellites to define the system performance and focus on cost-effective production in an industrial environment. Also consistent with GAO best practices, MDA plans to separate technology discovery from technology development by ensuring that critical technologies are matured before large-scale acquisition begins. MDA plans to utilize systems and components for the PTSS design that are currently used in commercial satellite sensors without significantly altering form, fit, or function. Additionally, the Director of MDA stated that a hallmark of the PTSS satellites will be their relatively small size and simplistic design. MDA also plans to follow an incremental path toward meeting user needs by using currently available technology to deliver near-term capabilities while maintaining the flexibility to add capabilities later. However, in order to meet its optimistic schedule to field an operational constellation by fiscal year 2018, MDA plans to conduct prototyping efforts beginning in fiscal year 2011 and launch two prototype satellites in fiscal year 2015. MDA also plans to launch a minimum of seven additional satellites by fiscal year 2018. Although PTSS is not yet far enough along in development to determine whether MDA's current acquisition plans are overly optimistic, other DOD space programs, for example, SBIRS High, have experienced long development times to launch initial satellites. Also, the development initiative must overcome several technology design challenges. For example, AT&L officials have identified key technical design challenges including developing sufficient sensitivity to detect and track postboost ballistic missiles, tracking large raids of ballistic missiles, and mass-producing payloads. According to AT&L officials, the program plans to address these design challenges through the use of computer modeling and simulations and refining payload design models. MDA will collect critical risk reduction data during STSS flight tests to help inform PTSS design.

Source: GAO analysis of DOD data and previous GAO reports.

[a]The Office of the Director, Defense Research and Engineering, *Department of Defense Technology Readiness Assessment (TRA) Deskbook*, Table 3-1 and Appendix B (July 2009), and Department of Defense Instruction 5000.02, *Operation of the Defense Acquisition System*, enc. 2 paras. 5.a and 5.d.(4) (Dec. 8, 2008).

[b]According to DOD, it selected a single increment, multiple release approach as the most efficient means to develop capabilities when needed, based on technology maturity and available funding.

[c]The National Aeronautics and Space Administration originally developed TRLs as a tool to assess technology maturity. TRLs are measured on a scale from 1 to 9, beginning with paper studies of a technology's feasibility (TRL 1) and culminating with application of the technology in its final form and under mission conditions (TRL 9). Demonstration that pieces will work together in a laboratory is TRL 4. Demonstration in a simulated environment is TRL 5. Our best practices work has shown that a TRL 7—demonstration of a technology in a realistic environment—is the level of technology maturity that constitutes a low risk for starting a product development program. We ordinarily assess satellite technologies that have achieved TRL 6, a prototype demonstrated in a relevant environment, as fully mature because of the difficulty of demonstrating maturity in a realistic environment—space. However, this does not apply to programs such as JMS and Space Fence which are ground based.

[f]In general terms, the Space Fence phased array radar—analogous to tens of thousands to hundreds of thousands of miniature radar antennas—is to use digital beam forming, which allows the antennas to work in concert, creating sufficient power transmitted and received to conduct the space surveillance and tracking mission.

[g]Department of Defense Instruction 5000.02, *Operation of the Defense Acquisition System*, enc. 2 para. 5.d.(7) (Dec. 8, 2008), states that a project shall exit the technology development phase when the technology has been demonstrated in a relevant environment, which is TRL 6.

RESULTS OF GAO SPACE-RELATED REVIEWS OVER THE PAST YEAR

Over the past year, we have completed reviews of sustaining and upgrading GPS capabilities and commercializing space technologies under the Small Business Innovation Research program (SBIR),[2] and we have ongoing reviews of: (1) DOD space situational awareness (SSA) acquisition efforts, (2) parts quality for DOD, MDA, and the National Aeronautics and Space Administration (NASA), and (3) a new acquisition strategy being developed for the EELV program. These reviews, discussed further below, underscore the varied challenges that still face the DOD space community as it seeks to complete problematic legacy efforts and deliver modernized capabilities. Our reviews of GPS and space situational awareness, for instance, have highlighted the need for more focused coordination and leadership for space activities that touch a wide range of government, international, and industry stakeholders; while our review of the SBIR program highlighted the substantial barriers

[2] GAO, Global Positioning System: Challenges in Sustaining and Upgrading Capabilities Persist, GAO–10–636 (Washington, DC, Sept. 15, 2010) and Space Acquisitions: Challenges in Commercializing Technologies Developed under the Small Business Innovation Research Program, GAO–11–21 (Washington, DC: Nov. 10, 2010).

and challenges small business must overcome to gain entry into the government space arena.

- GPS. We found that the GPS IIIA schedule remains ambitious and could be affected by risks such as the program's dependence on a ground system that will not be completed until after the first IIIA launch. We found that the GPS constellation availability had improved, but in the longer term, a delay in the launch of the GPS IIIA satellites could still reduce the size of the constellation to fewer than 24 operational satellites—the number that the U.S. Government commits to—which might not meet the needs of some GPS users. We also found that the multiyear delays in the development of GPS ground control systems were extensive. Although the Air Force had taken steps to enable quicker procurement of military GPS user equipment, there were significant challenges to its implementation. This has had a significant impact on DOD as all three GPS segments—space, ground control, and user equipment—must be in place to take advantage of new capabilities. Additionally, we found that DOD had taken some steps to better coordinate all GPS segments, including laying out criteria and establishing visibility over a spectrum of procurement efforts, but it did not go as far as we recommended in 2009 in terms of establishing a single authority responsible for ensuring that all GPS segments are synchronized to the maximum extent practicable.[3] Such an authority is warranted given the extent of delays, problems with synchronizing all GPS segments, and importance of new capabilities to military operations. As a result, we reiterated the need to implement our prior recommendation.
- Small Business Innovation Research (SBIR). In response to a request from this subcommittee, we found that while DOD is working to commercialize space-related technologies under its SBIR program by transitioning these technologies into acquisition programs or the commercial sector, it has limited insight into the program's effectiveness.[4] Specifically, DOD has invested about 11 percent of its fiscal years 2005–2009 research and development funds through its SBIR program to address space-related technology needs. Additionally, DOD is soliciting more space-related research proposals from small businesses. Further, DOD has implemented a variety of programs and initiatives to increase the commercialization of SBIR technologies and has identified instances where it has transitioned space-related technologies into acquisition programs or the commercial sector. However, DOD lacks complete commercialization data to determine the effectiveness of the program in transitioning space-related technologies into acquisition programs or the commercial sector. Of the nearly 500 space-related contracts awarded in fiscal years 2005 through 2009, DOD officials could not, for various reasons, identify the total number of technologies that transitioned into acquisition programs or the commercial sector. Further, there are challenges to executing the SBIR program that DOD officials acknowledge and are planning to address, such as the lack of overarching guidance for managing the DOD SBIR program.

Under this review, most stakeholders we spoke with—DOD, prime contractors, and small business officials—generally agreed that small businesses participating in the DOD SBIR program face difficulties transitioning their space-related technologies into acquisition programs or the commercial sector. Although we did not assess the validity of the concerns cited, stakeholders we spoke with identified challenges inherent to developing space technologies; challenges because of the SBIR program's administration, timing, and funding issues; and other challenges related to participating in the DOD space system acquisitions environment. For example, some small-business officials said that working in the space community is challenging because the technologies often require more expensive materials and testing than other technologies. They also mentioned that delayed contract awards and slow contract disbursements have caused financial hardships. Additionally, several small businesses cited concerns with safeguarding their intellectual property.

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[3] GAO, Global Positioning System: Significant Challenges in Sustaining and Upgrading Widely Used Capabilities, GAO–09–325 (Washington, DC: Apr. 30, 2009).

[4] The Small Business Innovation Development Act of 1982, Pub. L. No. 97–219, established the SBIR program to stimulate technological innovation, use small businesses to meet Federal research and development needs, foster and encourage participation by minority and disadvantaged persons in technological innovation, and increase private-sector commercialization of innovations derived from Federal research and development.

• Space Situational Awareness (SSA). We have found that while DOD has significantly increased its investment and planned investment in SSA acquisition efforts in recent years to address growing SSA capability shortfalls, most efforts designed to meet these shortfalls have struggled with cost, schedule, and performance challenges and are rooted in systemic problems that most space system acquisition programs have encountered over the past decade. Consequently, in the past 5 fiscal years, DOD has not delivered significant new SSA capabilities as originally expected. Capabilities that were delivered served to sustain or modernize existing systems versus closing capability gaps. To its credit, last fall the Air Force launched a space-based sensor that is expected to appreciably enhance SSA. However, two critical acquisition efforts that are scheduled to begin development within the next 2 years—Space Fence and JMS—face development challenges and risks, such as the use of immature technologies and planning to deliver all capabilities in a single, large increment versus smaller and more manageable increments. It is essential that these acquisitions are placed on a solid footing at the start of development to help ensure that their capabilities are delivered to the warfighter as and when promised. DOD plans to begin delivering other new capabilities in the coming 5 years, but it is too early to determine the extent to which these additions will address capability shortfalls.

We have also found that there are significant inherent challenges to executing and overseeing the SSA mission, largely because of the sheer number of governmentwide organizations and assets involved in the mission. This finding is similar to what we have reported from other space system acquisition reviews over the years. Additionally, while the recently issued National Space Policy assigns SSA responsibility to the Secretary of Defense, the Secretary does not necessarily have the corresponding authority to execute this responsibility. However, actions, such as development of a national SSA architecture, are being taken that could help facilitate management and oversight governmentwide. The National Space Policy, which recognizes the importance of SSA, directs other positive steps, such as the determination of roles, missions, and responsibilities to manage national security space capabilities and the development of options for new measures for improving SSA capabilities. Furthermore, the recently issued National Security Space Strategy could help guide the implementation of the new space policy. We expect our report based on this review to be issued in June 2011.

• Parts quality for DOD, MDA, and NASA. Quality is paramount to the success of DOD space systems because of their complexity, the environment they operate in, and the high degree of accuracy and precision needed for their operations. Yet in recent years, many programs have encountered difficulties with quality workmanship and parts. For example, DOD's AEHF protected communications satellite has yet to reach its intended orbit because of a blockage in a propellant line. Also, MDA's STSS program experienced a 15-month delay in the launch of demonstration satellites because of a faulty manufacturing process of a ground-to-spacecraft communication system part. Furthermore, NASA's Mars Science Laboratory program experienced a 1-year delay in the development of the descent and cruise stage propulsion systems because of a welding process error. We plan to issue a report on the results of a review that focuses specifically on parts quality issues in June 2011. We are examining the extent to which parts quality problems are affecting DOD, MDA, and NASA space and missile defense programs; the causes of these problems; and initiatives to detect and prevent parts quality problems.

• EELV acquisition strategy. DOD spends billions of dollars on launch services and infrastructure through two families of commercially owned and operated vehicles under the EELV program. This investment allows the Nation to launch its national security satellites that provide the military and intelligence community with advanced space-based capabilities. DOD is preparing to embark on a new acquisition strategy for the EELV program. Given the costs and importance of space launch activities, it is vital that this strategy maximize cost efficiencies while still maintaining a high degree of mission assurance and a healthy industrial base. We are currently reviewing activities leading up to the strategy and plan to issue a report on the results of this review in June 2011. In particular, we are examining whether DOD has the knowledge it needs to develop a new EELV acquisi-

tion strategy and the extent to which there are important factors that could affect launch acquisitions.

DOD HAS TAKEN AND IS TAKING ACTIONS TO ADDRESS SPACE AND WEAPON ACQUISITION PROBLEMS

DOD continues to work to ensure that its space programs are more executable and produce a better return on investment. Many of the actions it has been taking address root causes of problems, though it will take time to determine whether these actions are successful and they need to be complemented by decisions on how best to lead, organize, and support space activities.

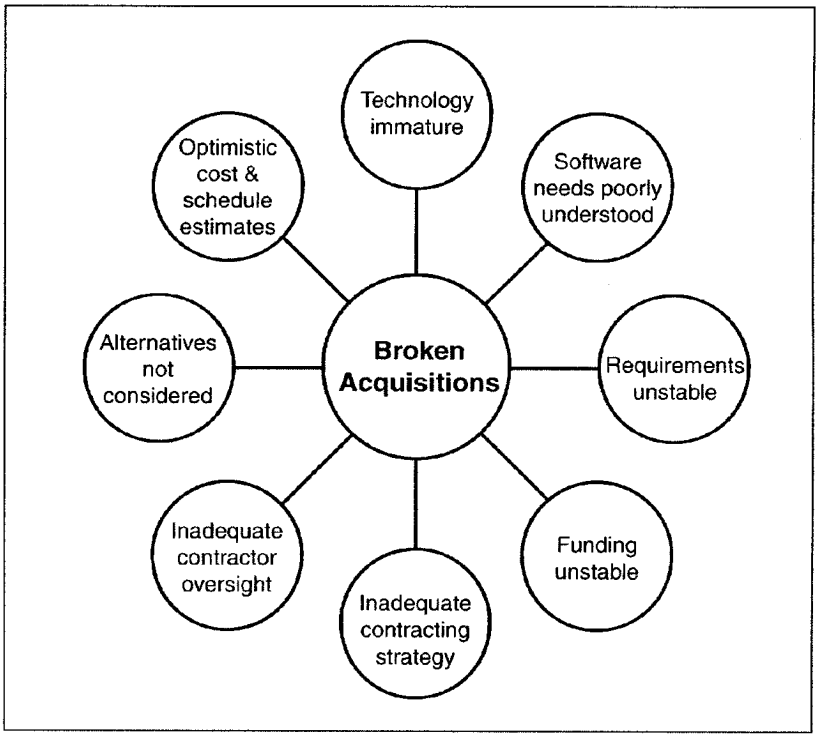
Causes of Acquisition Problems and Best Practices for Avoiding Them

Our past work has identified a number of causes of the cost growth and related problems, but several consistently stand out. First, on a broad scale, DOD has tended to start more weapon programs than it can afford, creating a competition for funding that encourages low cost estimating, optimistic scheduling, overpromising, suppressing bad news, and for space programs, forsaking the opportunity to identify and assess potentially more executable alternatives. Programs focus on advocacy at the expense of realism and sound management. Invariably, with too many programs in its portfolio, DOD is forced to continually shift funds to and from programs—particularly as programs experience problems that require additional time and money to address. Such shifts, in turn, have had costly, reverberating effects.

Second, DOD has tended to start its space programs too early, that is, before it has the assurance that the capabilities it is pursuing can be achieved within available resources and time constraints. This tendency is caused largely by the funding process, since acquisition programs attract more dollars than efforts concentrating solely on proving technologies. Nevertheless, when DOD chooses to extend technology invention into acquisition, programs experience technical problems that require large amounts of time and money to fix. Moreover, when this approach is followed, cost estimators are not well positioned to develop accurate cost estimates because there are too many unknowns. Put more simply, there is no way to accurately estimate how long it would take to design, develop, and build a satellite system when critical technologies planned for that system are still in relatively early stages of discovery and invention.

Third, programs have historically attempted to satisfy all requirements in a single step, regardless of the design challenges or the maturity of the technologies necessary to achieve the full capability. DOD has preferred to make fewer but heavier, larger, and more complex satellites that perform a multitude of missions rather than larger constellations of smaller, less complex satellites that gradually increase in sophistication. This has stretched technology challenges beyond current capabilities in some cases and vastly increased the complexities related to software. Programs also seek to maximize capability on individual satellites because it is expensive to launch them. Figure 6 illustrates the various factors that can break acquisitions.

Figure 6: Key Underlying Problems that Can Break Acquisitions



Source: GAO.

Many of these underlying issues affect the broader weapons portfolio as well, though we have reported that space programs are particularly affected by the wide disparity of users, including DOD, the intelligence community, other Federal agencies, and in some cases, other countries, U.S. businesses, and citizens. Moreover, problematic implementation of an acquisition strategy in the 1990s, known as Total System Performance Responsibility, for space systems resulted in problems on a number of programs because it was implemented in a manner that enabled requirements creep and poor contractor performance—the effects of which space programs are finally overcoming. We have also reported on shortfalls in resources for testing new technologies, which, coupled with less expertise and fewer contractors available to lead development efforts, have magnified the challenge of developing complex and intricate space systems.

Our work—which is largely based on best practices in the commercial sector—has recommended numerous actions that can be taken to address the problems we identified. Generally, we have recommended that DOD separate technology discovery from acquisition, follow an incremental path toward meeting user needs, match resources and requirements at program start, and use quantifiable data and demonstrable knowledge to make decisions to move to next phases. We have also identified practices related to cost estimating, program manager tenure, quality assurance, technology transition, and an array of other aspects of acquisition program management that could benefit space programs. These practices are highlighted in appendix I.

Actions to Improve Space and Weapon System Acquisitions

Over the past several years, DOD has implemented or has been implementing a number of actions to reform how space and weapon systems are acquired, both

through its own initiatives as well as those required by statute. Additionally, DOD is evaluating and proposing new actions to increase space system acquisition efficiency and effectiveness. Because many of these actions are relatively new, or not yet fully implemented, it is too early to tell whether they will be effective or effectively implemented.

For space in particular, DOD is working to ensure that critical technologies are matured before large-scale acquisition programs begin, requirements are defined early in the process and are stable throughout, and system design remains stable. DOD also intends to follow incremental or evolutionary acquisition processes versus pursuing significant leaps in capabilities involving technology risk and has done so with the only new major satellite program undertaken by the Air Force in recent years—GPS IIIA. DOD is also providing more program and contractor oversight and putting in place military standards and specifications in its acquisitions. Additionally, DOD and the Air Force are working to streamline management and oversight of the national security space enterprise. For example, all Air Force space system acquisition responsibility has been aligned to the office that has been responsible for all other Air Force acquisition efforts, and the Defense Space Council—created last year—is reviewing, as one of its first agenda items, options for streamlining the many committees, boards, and councils involved in space issues. These and other actions that have been taken or are being taken that could improve space system acquisition outcomes are described in table 2.

Table 2: Actions Taken or Being Taken That Could Benefit Space System Acquisition Outcomes

Category	Actions
National policy	• In June 2010, the President of the United States issued the new *National Space Policy* which establishes overarching national policy for the conduct of U.S. space activities. The policy states that the Secretary of Defense and the Director of National Intelligence are responsible for developing, acquiring, and operating space systems and supporting information systems and networks to support U.S. national security and enable defense and intelligence operations. The policy helps to clarify the Secretary of Defense's roles and responsibilities for coordinating space system acquisitions that span DOD and federal agencies, such as those for space situational awareness. • In January 2011, the Secretary of Defense and the Director of National Intelligence issued the *National Security Space Strategy* to build on the *National Space Policy* and help inform planning, programming, acquisition, operations, and analysis.
Acquisition policy	• We expressed concern over DOD's tailored national security space acquisition policy—initially issued in 2003—primarily because it did not alter DOD's practice of committing to major investments before knowing what resources will be required to deliver promised capability. Instead, the policy encouraged development of leading-edge technology within product development, that is, at the same time the program manager is designing the system and undertaking other product development activities. In 2009, DOD eliminated the space acquisition policy and moved the acquisition of space systems under DOD's updated acquisition guidance for defense acquisition programs (DOD Instruction 5000.02). In October 2010, the Under Secretary of Defense for Acquisition, Technology and Logistics issued a new space acquisition policy to be incorporated into DOD Instruction 5000.02 that introduces specific management and oversight processes for acquiring major space systems, including retaining the requirement for independent program assessments to be conducted prior to major acquisition milestones.
Management and oversight	• In August 2010, the Secretary of Defense announced the elimination of the Office of the Assistant Secretary of Defense for Networks and Information Integration (ASD/NII) as part of a broader effort to eliminate organizations that perform duplicative functions or that have outlived their purpose.[4] The elimination of this organization may help to reduce the problems associated with the wide range of stakeholders within DOD responsible for overseeing the development of space-based capabilities. • In May 2009, Air Force leadership signed the *Acquisition Improvement Plan* which lists five initiatives for improving how the Air Force obtains new capabilities.[5] One of these initiatives relates to establishing clear lines of authority and accountability within acquisition organizations. In August 2010, the Secretary of the Air Force transferred space system acquisition responsibility from the Under Secretary of the Air Force to the Assistant Secretary of the Air Force for Acquisition, thereby aligning all Air Force acquisition responsibility to one office. As part of this realignment, the Program Executive Officer for Space now reports to the Assistant Secretary of the Air Force for Acquisition (previously, the Program Executive Officer for Space reported to the Under Secretary of the Air Force).

Category	Actions
	• In November 2010, the Deputy Secretary of Defense authorized the disestablishment of the National Security Space Office (NSSO).[3] The elimination of this office may also help to streamline national security space system acquisition management and oversight. Furthermore, the Deputy Secretary of Defense revalidated the Secretary of the Air Force as DOD Executive Agent for Space and directed the creation of a Defense Space Council (DSC)—chaired by the DOD Executive Agent for Space and with representatives from across DOD—to inform, coordinate, and resolve space issues for DOD. The DSC held its first meeting in December 2010. According to DOD, first on the council's agenda was streamlining the many defense and national security space committees, boards, and councils by reviewing more than 15 space-related organizations and making recommendations on their cancellation, consolidation, dissolution, or realignment under the DSC.
Requirements	• Another of the Air Force's *Acquisition Improvement Plan* initiatives covers requirements generation and includes the direction for the Air Force to certify that the acquisition community can successfully fulfill required capabilities in conjunction with the Air Force Requirements for Operational Capabilities Council. Certification means the required capabilities can be translated in a clear and unambiguous way for evaluation in a source selection, are prioritized if appropriate, and are organized into feasible increments of capability.
Program management assistance	• The Space and Missile Systems Center—the Air Force's primary organization responsible for acquiring space systems—resurrected a program management assistance group in 2007 to help mitigate program management, system integration, and program control deficiencies within specific ongoing programs. This group assists and supplements wing commanders and program offices in fixing common problems, raising core competencies, and providing a consistent culture that sweeps across programs. As we reported last year, the GPS Wing Commander stated this group was an integral part of the overall process providing application-oriented training, templates, analyses, and assessments vital to the GPS IIIA baseline review. According to a senior program management assistance group official, the group has provided assistance to other major programs, including GPS OCX, SBIRS High, and SBSS.
Workforce	• Another initiative in the Air Force's *Acquisition Improvement Plan* is to revitalize the acquisition workforce by, among other things, increasing the number of authorized positions and providing for additional hiring, examining the proper mix of military and civilian personnel, and establishing training and experience objectives as part of the career paths for each acquisition specialty and increasing the availability of specialized training. Also, as we reported last year, the Air Force was continuing efforts to bring space operators and space system acquirers together through the Advanced Space Operations School and the National Security Space Institute. The Air Force anticipated that this higher-level education would be integral to preparing space leaders with the best acquisition know-how.
Cost estimating	• The Air Force took actions to strengthen cost estimating. For example, we recommended that the Secretary of the Air Force ensure that cost estimates are updated as major events occur within a program that could have a material impact on cost, and that the roles and responsibilities of the various Air Force cost-estimating organizations be clearly articulated.[6] An Air Force policy directive now requires that cost estimates for major programs be updated annually, and lays out roles and responsibilities for Air Force cost-estimating organizations. Additionally, the Joint Space Cost Council—formed in 2007 with membership across industry and military and civil government agencies—is actively working to improve cost credibility and realism in estimates, budgets, schedules, data, proposals, and program execution. For example, one initiative has developed a standard work breakdown structure that is being vetted through industry and government.
Military standards	• Over the last several years, the Air Force Space and Missile Systems Center has taken action aimed at preventing parts quality problems by issuing policy relating to specifications and standards. It is requiring the GPS IIIA program development contractor to meet these specifications and standards.

Source: GAO analysis of DOD data and previous GAO reports.

[4]The ASD/NII's responsibilities included serving as the principal staff assistant on nonintelligence space matters; information technology, including National Security Systems; information resource management; and sensitive information integration. The ASD/NII also served as the principal staff assistant for issues such as command and control and net-centric capabilities.

[5]The Secretary of the Air Force and Chief of Staff of the Air Force issued the *Acquisition Improvement Plan* to recapture acquisition excellence by rebuilding an Air Force acquisition culture that delivers products and services as promised—on time, within budget, and in compliance with all laws, policies, and regulations. The plan consists of five initiatives: (1) revitalize the Air Force acquisition workforce, (2) improve the requirements generation process, (3) instill budget and financial discipline, (4) improve major Air Force systems source selections, and (5) establish clear lines of authority and accountability within acquisition organizations.

[6]As part of this direction, the Deputy Secretary of Defense authorized the establishment of a jointly manned space office to restructure and replace the NSSO. The NSSO supported the Secretary of the Air Force who, as the DOD Executive Agent for Space, was responsible for developing, coordinating, and integrating plans and programs for space systems and the acquisition of DOD space major defense acquisition programs, and was responsible for executing the space major defense acquisition programs, when delegated that authority by the Under Secretary of Defense for Acquisition, Technology and Logistics. The specific roles and responsibilities of the DOD Executive Agent for Space are defined in Department of Defense Directive 5101.2, *DOD Executive Agent for Space* (June 3, 2003).

[6]GAO, *Space Acquisitions: DOD Needs to Take More Action to Address Unrealistic Initial Cost Estimates of Space Systems*, GAO-07-96 (Washington, D.C.: Nov. 17, 2006).

At the DOD-wide level, and as we reported last year, Congress and DOD have recently taken major steps toward reforming the defense acquisition system in ways that may increase the likelihood that weapon programs will succeed in meeting planned cost and schedule objectives.[5] In particular, new DOD policy and legislative provisions place greater emphasis on front-end planning and establishing sound

[5]GAO, Defense Acquisitions: Strong Leadership Is Key to Planning and Executing Stable Weapon Programs, GAO–10–522 (Washington, DC: May 6, 2010).

business cases for starting programs.[6] For example, the provisions require programs to invest more time and resources to refine concepts through practices such as early systems engineering, strengthen cost estimating, develop technologies, build prototypes, hold early milestone reviews, and develop preliminary designs before starting system development. These provisions are intended to enable programs to refine a weapon system concept and make cost, schedule, and performance trade-offs before significant commitments are made. In addition, DOD policy requires establishment of configuration steering boards that meet annually to review program requirements changes as well as to make recommendations on proposed descoping options that could reduce program costs or moderate requirements. Fundamentally, these provisions should help (1) programs replace risk with knowledge and (2) set up more executable programs. Key DOD and legislative provisions compared with factors we identified in programs that have been successful in meeting cost and schedule baselines are summarized in table 3.

Table 3: Comparison of Factors Contributing to Meeting Cost and Schedule Goals and Recent Acquisition Reform Initiatives

Success factors	Recent acquisition reform initiatives
• Establish a sound, executable business case	• Overall, strong emphasis on front-end planning (pre-systems acquisition)
• Incremental approach to acquiring capabilities	• Incremental development emphasized, with each increment that provides a significant increase in capability to be managed separately
• Clear, well-defined requirements	• Early reviews to be conducted prior to start of development (Milestone B) • Enhanced requirements for Analysis of Alternatives • New leadership positions established to enhance systems engineering and developmental testing
• Leverage mature technologies	• Independent review of technology maturity and integration risk prior to Milestone B • Competitive prototypes • Preliminary Design Review to be conducted earlier, prior to Milestone B
• Establish realistic cost and schedule estimates	• New position and organization established to review and conduct independent cost estimates for major defense acquisition programs and provide cost-estimating guidance DOD-wide • Early cost estimate required for Milestone A • Confidence level for cost estimates to be reported
Execute business case in disciplined manner	
• Resist new requirements	• Configuration steering boards established to stabilize requirements • Post-Critical Design Review assessment required to review progress

Source: GAO analysis of the Weapon Systems Acquisition Reform Act of 2009, Pub. L. No. 111-23 and Department of Defense Instruction 5000.02 (Dec. 8, 2008).

Furthermore, the Ike Skelton National Defense Authorization Act for Fiscal Year 2011, signed into law on January 7, 2011, contains further direction aimed at improving acquisition outcomes, including, among other things, a requirement for the Secretary of Defense to issue guidance on the use of manufacturing readiness levels (including specific levels that should be achieved at key milestones and decision points), elevating the role of combatant commanders in DOD's requirements-setting process, and provisions for improving the acquisition workforce.[7]

While it is too soon to determine if Congress's and DOD's reform efforts will improve weapon program outcomes, DOD has taken steps to implement the provisions. For example, in December 2009, the department issued a new implementation policy, which identifies roles and responsibilities and institutionalizes many of the requirements of the Weapon Systems Acquisition Reform Act of 2009. DOD has also filled several key leadership positions created by the legislation, including the Directors for Cost Assessment and Program Evaluation, Developmental Test and Evaluation, Systems Engineering, and Performance Assessments and Root Cause Analyses. To increase oversight, the department embarked on a 5-year effort to increase the size of the acquisition workforce by up to 20,000 personnel by 2015. Furthermore, the department began applying the acquisition reform provisions to some new programs currently in the planning pipeline. For example, many of the pre-Milestone B programs we reviewed this year as part of our annual assessment of selected weapon programs planned to conduct preliminary design reviews before going to Milestone B, although fewer are taking other actions, such as developing prototypes, that could improve their chances of success. With respect to space system acquisitions, particularly GPS III—DOD's newest major space system acquisition—has em-

[6] In December 2008, DOD revised its acquisition instruction—Department of Defense Instruction 5000.02, Operation of the Defense Acquisition System. The Weapon Systems Acquisition Reform Act of 2009, Pub. L. No. 111–23, was enacted May 22, 2009.

[7] Pub. L. No. 111–383.

braced the knowledge-based concepts behind our previous recommendations as a means of preventing large cost overruns and schedule delays.

Additionally, the Office of the Secretary of Defense and the Air Force are proposing new acquisition strategies for satellites and launch vehicles:

- In June of last year, and as part of the Secretary of Defense's Efficiencies Initiative,[8] the Under Secretary of Defense for Acquisition, Technology and Logistics began an effort to restore affordability and productivity in defense spending. Major thrusts of this effort include targeting affordability and controlling cost growth, incentivizing productivity and innovation in industry, promoting real competition, improving tradecraft in services acquisition, and reducing nonproductive processes and bureaucracy. As part of this effort, the Office of the Secretary of Defense and the Air Force are proposing a new acquisition strategy for procuring satellites, called the Evolutionary Acquisition for Space Efficiency (EASE), to be implemented starting in fiscal year 2012. Primary elements of this strategy include block buys of two or more satellites (economic order quantities) using a multiyear procurement construct, use of fixed-price contracting, stable research and development investment, evolutionary development, and stable requirements. According to DOD, EASE is intended to help stabilize funding, staffing, and subtier suppliers; help ensure mission continuity; reduce the impacts associated with obsolescence and production breaks; and increase long-term affordability with cost savings of over 10 percent. DOD anticipates first applying the EASE strategy to procuring two AEHF satellites beginning in fiscal year 2012, followed by procurement of two SBIRS High satellites beginning in fiscal year 2013. According to the Air Force, it will consider applying the EASE strategy—once it is proven—to other space programs, such as GPS III. We have not yet conducted a review of the EASE strategy to assess the potential benefits, challenges, and risks of its implementation. Questions about this approach would include the following:
  - What are the major risks incurred by the government in utilizing the EASE acquisition strategy?
  - What level of risks (known unknowns and unknown unknowns) is being assumed in the estimates of savings to be accrued from the EASE strategy?
  - How are evolutionary upgrades to capabilities to be pursued under EASE?
  - How does the EASE acquisition strategy reconcile with the current Federal and DOD acquisition policy, acquisition and financial management regulations, and law?
- The Air Force is developing a new acquisition strategy for its EELV program. Primarily, under the new strategy, the Air Force and National Reconnaissance Office are expected to initiate block buys of eight first stage booster cores—four for each EELV family, Atlas V and Delta IV—per year over 5 years to help stabilize the industrial base, maintain mission assurance, and avoid cost increases. As mentioned earlier, we have initiated a review of the development of the new strategy and plan to issue a report on our findings in June 2011. Given concerns raised through recent studies about visibility into costs and the industrial base supporting EELV, it is important that this strategy be supported with reliable and accurate data.

ADDITIONAL ACTIONS LEADERSHIP, ORGANIZATION, AND SUPPORT MAY STILL BE NEEDED

The actions that the Office of the Secretary of Defense and the Air Force have been taking to address acquisition problems listed in tables 2 and 3 are good steps. However, more changes to processes, policies, and support may be needed—along with sustained leadership and attention—to help ensure that these reforms can take hold, including addressing the diffuse leadership for space programs. Diffuse leadership has had a direct impact on the space system acquisition process, primarily because it has made it difficult to hold any one person or organization accountable for balancing needs against wants, for resolving conflicts among the many organizations involved with space, and for ensuring that resources are dedicated where they need to be dedicated. This has hampered DOD's ability to synchronize delivery of space, ground, and user assets for space programs. For instance, many of the cost and schedule problems we identified on the GPS program were tied in part to diffuse leadership and organizational stovepipes throughout DOD, particularly with respect

[8] In May 2010, the Secretary of Defense announced the Defense Efficiencies Initiative to increase efficiencies, reduce overhead costs, and eliminate redundant functions in order to improve the effectiveness of the DOD enterprise. The goal is to apply savings from this initiative to force structure and modernization.

to DOD's ability coordinate delivery of space, ground, and user assets. Additionally, we have recently reported that DOD faces a situation where satellites with advances in capability will be residing for years in space without users being able to take full advantage of them because investments and planning for ground, user, and space components were not well coordinated.[9] Specifically, we found that the primary cause for user terminals not being well synchronized with their associated space systems is that user terminal development programs are typically managed by different military acquisition organizations than those managing the satellites and ground control systems.

Recent studies and reviews examining the leadership, organization, and management of national security space have found that there is no single authority responsible below the President and that authorities and responsibilities are spread across the department.[10] In fact, the national security space enterprise comprises a wide range of government and nongovernment organizations responsible for providing and operating space-based capabilities serving both military and intelligence needs.

While some changes to the leadership structure have recently been made—including revalidating the role of the Secretary of the Air Force as the DOD Executive Agent for Space, disestablishing the Office of the assistant Secretary of Defense for Networks and Information Integration and the National Security Space Office, and aligning Air Force space system acquisition responsibility into a single Air Force acquisition office—and others are being studied, it is too early to tell how effective these changes will be in streamlining management and oversight of space system acquisitions. Additionally, while the recently issued National Space Policy assigns responsibilities for governmentwide space capabilities, such as those for SSA, it does not necessarily assign the corresponding authority to execute the responsibilities.

Finally, adequate workforce capacity is essential for the front-end planning activities now required by acquisition reform initiatives for new weapon programs to be successful. However, studies have identified insufficient numbers of experienced space system acquisition personnel and inadequate continuity of personnel in project management positions as problems needing to be addressed in the space community. For example, a recent Secretary of the Air Force-directed Broad Area Review of space launch noted that while the Air Force Space and Missile Systems Center workforce had decreased by about 25 percent in the period from 1992 to 2010, the number of acquisition programs had increased by about 41 percent in the same time period.[11] Additionally, our own studies have identified gaps in key technical positions, which we believed increased acquisition risks. For instance, in a 2008 review of the EELV program, we found that personnel shortages in the EELV program office occurred particularly in highly specialized areas.[12] According to the EELV program office and Broad Area Review, this challenge persists.

CONCLUDING REMARKS

DOD is working to position itself to improve its space system acquisitions. After more than a decade of acquisition difficulties—which have created potential gaps in capability, diminished DOD's ability to invest in new space systems, and lessened DOD's credibility to deliver high-performing systems within budget and on time—DOD is starting to launch new generations of satellites that promise vast enhancements in capability. In 1 year, DOD has or expects to have launched newer generations of navigation, communications, SSA, and missile warning satellites. Moreover, given the Nation's fiscal challenges, DOD's focus on fixing problems and implementing reforms rather than taking on new, complex, and potentially higher-risk efforts is promising. However, challenges to keeping space system acquisitions on track remain, including pursuing evolutionary acquisitions over revolutionary ones, managing requirements, providing effective coordination across the diverse organizations interested in space-based capabilities, and ensuring that technical and programmatic expertise are in place to support acquisitions. DOD's newest major space system acquisition efforts, such as GPS IIIA, DWSS, JMS, Space Fence, and the fol-

[9] GAO, Defense Acquisitions: Challenges in Aligning Space System Components, GAO–10–55 (Washington, DC: Oct. 29, 2009).

[10] Institute for Defense Analyses, Leadership, Management, and Organization for National Security Space: Report to Congress of the Independent Assessment Panel on the Organization and Management of National Security Space (Alexandria, VA, July 2008), and House Permanent Select Committee on Intelligence, Report on Challenges and Recommendations for United States Overhead Architecture (Washington, DC, Oct. 2008).

[11] Institute for Defense Analyses, Launch Broad Area Review 2010 (BAR–X) (Alexandria, VA, June 2010).

[12] GAO, Space Acquisitions: Uncertainties in the Evolved Expendable Launch Vehicle Program Pose Management and Oversight Challenges, GAO–08–1039 (Washington, DC: Sept. 26, 2008).

low-on to the SBSS will be key tests of how well DOD's reforms and reorganizations have positioned it to manage these challenges. We look forward to working with DOD to help ensure that these and other challenges are addressed.

Chairman Nelson, Ranking Member Sessions, this completes my prepared statement. I would be happy to respond to any questions you or other members of the subcommittee may have at this time.

CONTACTS AND ACKNOWLEDGMENTS

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APPENDIX I: ACTIONS NEEDED TO ADDRESS SPACE AND WEAPON ACQUISITION PROBLEMS

Before undertaking new programs

Prioritize investments so that projects can be fully funded and it is clear where projects stand in relation to the overall portfolio.

Follow an evolutionary path toward meeting mission needs rather than attempting to satisfy all needs in a single step.

Match requirements to resources—that is, time, money, technology, and people—before undertaking a new development effort.

Research and define requirements before programs are started and limit changes after they are started.

Ensure that cost estimates are complete, accurate, and updated regularly.

Commit to fully fund projects before they begin.

Ensure that critical technologies are proven to work as intended before programs are started.

Assign more ambitious technology development efforts to research departments until they are ready to be added to future generations (increments) of a product.

Use systems engineering to close gaps between resources and requirements before launching the development process.

During program development

Use quantifiable data and demonstrable knowledge to make go/no-go decisions, covering critical facets of the program such as cost, schedule, technology readiness, design readiness, production readiness, and relationships with suppliers.

Do not allow development to proceed until certain thresholds are met—for example, a high proportion of engineering drawings completed or production processes under statistical control.

Empower program managers to make decisions on the direction of the program and to resolve problems and implement solutions.

Hold program managers accountable for their choices.

Require program managers to stay with a project to its end.

Hold suppliers accountable to deliver high-quality parts for their products through such activities as regular supplier audits and performance evaluations of quality and delivery, among other things.

Encourage program managers to share bad news, and encourage collaboration and communication.

APPENDIX II: SCOPE AND METHODOLOGY

In preparing this testimony, we relied on our body of work in space programs, including previously issued GAO reports on assessments of individual space programs, common problems affecting space system acquisitions, and DOD's acquisition policies. We relied on our best practices studies, which comment on the persistent problems affecting space system acquisitions, the actions DOD has been taking to address these problems, and what remains to be done, as well as Office of the Secretary of Defense and Air Force documents addressing these problems and actions. We also relied on work performed in support of our annual weapons system assessments, and analyzed DOD funding estimates to assess cost increases and investment trends for selected major space system acquisition programs. The GAO work used in preparing this statement was conducted in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that

the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Senator NELSON. Thank you.

Senator Sessions.

Senator SESSIONS. Thank you, Mr. Chairman.

I sincerely apologize for not being able to be here when the hearing started. I want to thank all of our witnesses for being here.

Let me start by congratulating the Air Force for the successful launch of the first SBIRS. The long-anticipated launch of this first of a kind, state-of-the-art satellite is a significant accomplishment and I congratulate the Air Force upon this major milestone.

I don't need to remind our witnesses of the many challenges that led to the 9-year delay or the estimated $11.5 billion increase in total program cost. We just have to insist that DOD reverse that trend, as we go forward, that's been taking place over 2 decades. Maybe GAO can help. We must ensure that the taxpayers' money is spent wisely and that capabilities are delivered without delay or extra expense.

As DOD, and in particular the Air Force, enters a new era of space acquisition driven by decreasing budgets, and we will have some of that, we'll try to protect the military as much as we can. We know space assets cannot be eliminated from our future budgets. Some might think so, but they cannot. Our whole infrastructure, as the chairman knows, and communications systems are space-based that are so critical to DOD, we can't allow that to be eroded.

Being on the Senate Budget Committee, I have to tell you a lot of people are in denial about how serious our financial condition is. We're borrowing 40 cents of every dollar we spend, that cannot and will not continue. I would just share that with you. All of you are committed to the kind of procurement programs and expense reductions that help us strengthen our capabilities.

I'm pleased that GAO has joined us and look forward to hearing their latest assessment of space acquisition efforts. In the past GAO has expressed a number of valid concerns over cost overruns, schedule slips, and capability gaps. In the fiscal year 2012 budget, the Air Force announced its intent to change the way it procures our multi-billion dollar space capabilities, and I look forward to GAO's comments on that.

The fiscal year 2012 budget marks a fundamental shift for defense space. I appreciate that the Air Force has been working to ensure that its space programs are more executable and produce a better return on investment. However, I am concerned that some of this refocusing has come at the expense of needed investments in future technologies. The lack of sufficient technology risk reduction is a key reason we often experience cost overruns. Without that appropriate level of investment, we risk exacerbating the cycle of schedule slips, cost overruns, and credibility gaps.

With the release of the NSSS, DOD and the IC have proposed a framework for responding to the current and projected strategic space environment. The NSSS aptly characterizes the congested, contested, and competitive nature of the space domain.

However, I have significant concerns regarding the administration's stated intention of pursuing proposals and concepts for arms

control measures. Since the release of the NSSS in February, it appears the administration is planning to go forward and maybe sign the EU Code of Conduct for Outer Space Activities.

According to recent comments by Ambassador Schulte, the Deputy Assistant Secretary, who I thank you for joining us today, DOD has tentatively concluded that the EU Code of Conduct should be adopted and is consistent with the Obama administration's policy interests. I'm uncomfortable with these comments and have a number of questions.

Any pursuit of a multilateral arms control agreement on space capabilities could have a number of highly damaging implications for our national security interests. To date, the administration has not consulted with the Senate on its intent, nor shared any specific provisions. Furthermore, it remains unclear if the administration has the authority to enter into such agreement without advice and consent.

Mr. Chairman, this is an excellent panel. Thank you for convening it and thank you for your leadership and commitment to the defense of America. It's an honor for me to work with you.

Senator NELSON. Thank you, Senator Sessions. I feel likewise. We've worked on so many different things for so long; it's a pleasure to continue to do so.

I thought what we might do is have 6-minute rounds.

General Shelton, you assumed command of the AFSPC in January. On a broad basis, what do you see as your greatest challenges? What did you see when you took your responsibilities? What was the greatest challenges that you could see out there?

General SHELTON. Senator, there's probably three things that I have established as top priorities. First, is to continue to support the joint fight and continue to support our brothers and sisters in harm's way. Second, is to get control of the cost of space programs, and you both have talked some about that, and we are at that work mightily. Third, is to operationalize and normalize the cyberspace domain within the Air Force. Those are the three things that we've been focused on at the top level.

Senator NELSON. What plans do you have, on item number 2, to get control over the costs, which is one of the things that is foremost in our minds as we deal with budgetary issues?

General SHELTON. Yes, sir. A couple of things. First, is to do a better job of writing the requirements, such that we are not pushing the state-of-the-art of the technology, but rather that we accept very mature technologies. SBIRS is a very good case in point, we pushed pretty hard on the state-of-the-art and we ended up with long development timelines, over cost, and certainly over schedule.

Second, I would tell you, is to manage the kinds of contracts that we write. We have in the past gone with much more of a development approach, as opposed to acquiring with a fixed-price approach. Where government has shared the cost with the contractor, now we want the contractor to identify the cost upfront such that we can be much more deterministic in how we develop our cost estimates.

Senator NELSON. General Shelton, in some recent remarks at the National Space Symposium, you discussed the growing problem of space debris. You mentioned that the Air Force tracks approxi-

mately 20,000 objects, most of which is debris, and there are probably 10 times more objects that are too small to track at the same time, any one of which could be lethal to a satellite.

I'd note that when China tested its anti-satellite weapon in 2007, space debris increased by as much as 25 percent. The collision of two satellites in 2009 added even more debris.

Is there any possibility to remove some of that debris? For instance, we've heard of proposals to use a laser to remove that debris. Is there any other concept that's technologically possible that you might think of or that we might be able to develop? If it were feasible to have it, who would pay for it? Not just the United States, I would hope, but others who have contributed.

If it can't be removed and we're faced with it, what indeed are the options? One of the concerns, of course, is that more debris increases the chances of a collision that, oddly enough, creates more debris. Perhaps you can share your thoughts on that?

General SHELTON. Senator, you're exactly right. Debris begets debris, just from a probabilistic point of view. We have not found a way that is either technically nor economically viable to eliminate debris. What we have done, both nationally and internationally, is encouraged the conduct of space operations in a way that it minimizes debris. As we launch new satellites, as we reach end of life on satellites, we think about disposal of those satellites. We think about mitigation and minimization of debris. We're encouraging others across the world to do the same.

Senator NELSON. General Helms, to protect satellites you have to know what you're protecting them from. Improving space situational awareness, including the ability to detect and determine interference, is one of your major responsibilities. Obviously, there are many sensors that provide or could provide space situational awareness data. One of the problems, however, is the computer system that the JMS that utilizes this data to provide meaningful information, is old and no longer is able to handle the available data.

Upgrading this system has proven to be an acquisition challenge. Do you have, and if you do, what's your vision for how this system should work in the future?

General HELMS. Thank you, Mr. Chairman. Yes, we do have a vision, and you're exactly right. The Space Defense Operations Center system is currently the capability that we use in order to track objects in space, including our satellite operations and pieces of debris. We have a sensor suite that's all over the world, that contributes to a catalogue and allows us to have knowledge of what is going on in space.

The system on which that catalogue resides is aging rapidly. It's pretty much past its design life. It will become unsustainable due to the nature of the computer system that it rides on. This JMS capability is, in effect, a critical capability that we need to get in order to continue to do the mission that I'm responsible for, which is to have space situational awareness of all objects in space.

The vision is that, first, we get that replacement in a timely manner so that we don't have a gap, which I would call an absolutely critical gap, between what we have today and being able to

sustain what we have today, and then bring something on board that replaces it.

Second, we need to have a vision of an open architecture. What I mean by that is there are sensors that we have in JFCC Space, but there are also other sensors that are available, potentially through the MDA, for example. If we set this up right, we'd have an open architecture that will, in effect, allow us to leverage the exposure of sensor data from all over the world, not just from my own sensors, but from others' as well.

If we build a system with an open architecture such as that, then what we will have is a multiplying capability that will allow us to bring more capability to bear, to fuse data, and to watch the space environment.

Third, the JMS capability would bring interface to the space professionals. Right now, they're faced with lines of text. I've seen the products myself. It's very cumbersome to work with. It slows them down. They have to use sneakernet, as we call it, in order to manage the knowledge that's necessary to understand what's happening in the space environment.

If we were to be able to put some user interfaces in front of them that were more pictorial and much more comprehensive than what we're working with today, as is envisioned with the JMS capability, my young space professionals will take off. They will become much more sophisticated. They are really sharp. What they need is to have their creativity unleashed.

The way that the JMS capability is envisioned will allow that to happen. We will have some pretty amazing forces at work here to try to understand what's happening in the domain as we acknowledge it as congested, competitive, and contested.

Thank you.

Senator NELSON. Thank you, General.

Senator Sessions.

Senator SESSIONS. Thank you.

Ambassador Schulte, as I mentioned in my opening remarks, I am concerned about the EU Code of Conduct for Outer Space Activities. Can you tell us whether the administration intends to inform Congress prior to signing any multilateral commitments in space activities?

Ambassador SCHULTE. The headline that came out of my speech in Colorado Springs was: "Pentagon tentatively okays EU code." That headline was wrong. I trust that never happens here.

Let me step back and explain what we're trying to achieve, where we are, and try to address some of the concerns that you, Senator, and at least 36 other Senators have raised, too. The national space policy from the President says, as you mentioned, we will consider arm control in space. It sets out three criteria: It has to be effectively verifiable, it has to be equitable, and it has to serve our national security interest.

So far we haven't found an arms control agreement that does that. There's one on the table. It's been proposed by Russia and China. We have declared it, not very politely, but we've said it's fundamentally flawed because it's not verifiable and it's not clear it would even capture a lot of the Chinese counter-space systems that worry us.

Instead of pursuing arms control at this point, we're open to it, we're looking at what we call transparency and confidence-building measures, voluntary measures to encourage responsible use of space.

The one such set of measures that we are currently evaluating is the proposal from the EU, its proposed Code of Conduct for Outer Space Activities.

Senator SESSIONS. Let me tell you my concern, and I've seen this for a number of years since I've been in the Senate. We have, in space, the most capable program in the world by far. We've advanced further technologically, in development, and actual deployment of systems than anyone else. Agreements, codes of conduct, tend to constrain our military. Our military is fundamentally configured so it depends on space capability.

I would be a bit nervous, am a bit nervous, and want to examine carefully whether or not through some agreement we've constricted our ability to effectively defend our interests.

Let me ask you a few questions and see if you can answer them briefly, and if you can I'd appreciate it. Has the AFSPC or STRATCOM reviewed and provided an assessment at this date to the draft code of conduct?

Ambassador SCHULTE. Senator, in DOD, we are currently conducting an operations assessment of the EU code to see what the impact would be. Our goal isn't to constrain ourselves. We think we act pretty responsibly in space. The goal is to try to constrain new emergent space powers, to ensure they adopt procedures that would, for example, mitigate the creation of debris and avoid mishaps and instability in space.

The goal of the IC and DOD is to protect our national security equities. We also, as the strategy says, have a stake in a domain in which others are operating that's a bit more predictable. We want to encourage other countries to apply the same type of standards that we do in space.

Senator SESSIONS. Would there be any impact such as this in such an agreement, would there be anything that would impact a U.S. decision to deploy missile defense interceptors of any sort in space?

Ambassador SCHULTE. Sir, the EU code is about behavior in space, it's not about capabilities in space. It would not, for example, prohibit the deployment of space-based interceptors. Now, if somebody wanted to do that and they're going to create a lot of debris by doing so, we might say that's a bad approach. But it doesn't prohibit deployment of space-based interceptors.

Senator SESSIONS. As a practical matter, would it or could it impede our ability to do that?

Ambassador SCHULTE. No, sir, not as we understand it.

Senator SESSIONS. Is there anything in it that would impact the development, test, or deployment of an anti-satellite weapon such as the one successfully used in the 2008 Operation Burnt Frost?

Ambassador SCHULTE. Sir, it would not do that. It doesn't constrain capabilities; it constrains behavior. In fact, Operation Burnt Frost, and I was in Vienna at the time and we did very well there, not just from a technical standpoint, but from a diplomatic standpoint, we showed how we were acting responsibly to minimize de-

bris. In fact, the draft EU code as it now stands would allow such operations in the future.

Senator SESSIONS. Would it impact, in any way, the research, development, testing, or deployment of a kinetic defensive system in outer space, one that could take out a satellite and let's say we're in an area of hostilities. There's a satellite that's providing intelligence information that places our military personnel at risk. Is there anything that would in any way impact our research, development, and testing of such a kinetic defense system in outer space?

Ambassador SCHULTE. No, sir. It would discourage any activities that, again, would create a lot of debris.

Senator SESSIONS. But it would be hard under our current technology to destroy a satellite that's spying on our military. Would this agreement keep us from doing that?

Ambassador SCHULTE. Senator, actually there are many ways, that we can't discuss entirely here, to neutralize another satellite, and you can certainly do it without creating a lot of debris.

The other thing I should mention, sir, if I could, is that——

Senator SESSIONS. I'm not sure that I'm totally sold on that, that you can necessarily impact all satellites without creating debris. Are you sure that's accurate?

Ambassador SCHULTE. Sir, we could go into another session for that, certainly the Chinese, for example, are looking at ways of neutralizing satellites that don't create a lot of debris.

The other thing that——

Senator SESSIONS. Looking at it and doing it are two different things. Excuse me; go ahead.

Ambassador SCHULTE. Sir, I just wanted to mention, the code is voluntary, it can be put aside if you have to. It's not a treaty. It's not legally binding. It also is full of references to the inherent right of self defense, and you can imagine at DOD we appreciate that. It allows actions to be taken for self defense.

As General Kehler told another panel recently, we see it as largely consistent with our operations plans, with our current practice, but we are doing a detailed assessment.

Senator SESSIONS. What are your plans about advising and briefing Congress on this before anything is signed?

Ambassador SCHULTE. Sir, I would actually defer to the Department of State (DOS) about how to handle that with Congress. Having said that, though, in response to the letter that you and many of your colleagues signed, there was a response. We offered briefings to your staff. I'm happy to come meet with you separately on this. We understand that many have concerns about this and we're prepared to come and talk to you about them.

Senator SESSIONS. Are Russia and China involved in these discussions?

Ambassador SCHULTE. Russia and China are interesting. The two countries that are most nervous about the EU code are Russia and China. Part of that is because they see the code as a competitor to the arms control agreement that they've proposed, which we've found as fundamentally flawed. They've been a little bit reluctant to look at the code.

As they see more and more countries looking at the code they're thinking, gee, maybe we should look at this, too. We have encouraged them to consider it, making clear we haven't made a final decision. Again, we see this as a possible way to get the Russians and the Chinese to act more responsibly.

Only if we sign the code along with the EU, otherwise it's meaningless. We want to get the Russians and the Chinese into this type of framework. We want to get the Indians in there and we want to get Brazil. Again, the goal is in many ways to export the best practices that we use, to other parts of the world, to create a more predictable space environment, while still protecting our defense equities.

Senator SESSIONS. We've spent billions of dollars to produce a fabulous SATCOM network that is a critical part of our defense structure. I would hate to see us take any action that would neutralize any part of that capability we've invested so much to achieve.

Thank you.

Ambassador SCHULTE. Thank you, sir.

Senator NELSON. Thank you, Senator.

General Formica, the Army is heavily dependent on space systems for much of what you do, particularly in theater. This subcommittee is worried about disconnects between the equipment that enables the warfighter to utilize space systems, particularly GPS and communications, and the satellites themselves. Improved capability is on orbit, but the equipment is not fielded. Do you see this as an issue for the Army? What are your thoughts?

General FORMICA. Senator, thank you. As you said, the Army is invested in space capabilities and requires them in order to function our operating forces in theater and around the world. We are dependent on GPS SATCOMs, among others. Having reliable ground systems and being able to push those down to the lowest level is important to us and it is a capability that is something that needs to be developed and that we count on.

Senator NELSON. In your statement, you mention the Army space support teams. Apparently these teams play a vital function in providing space support to commanders in the field. In your view, do these teams have all the support they need or do they need additional support or access to information?

General FORMICA. Senator, again, thank you for the question. The Army space support teams and the space support elements which go at the various levels of Army commands and our operational forces are an essential part of our space cadre. We manage over 300 space professionals as part of the space cadre and they are well-trained. They train in a joint environment. They train not only at schools that we've developed at Space and Missile Defense Command, but we rely on the Air Force National Strategic Space Institute for some of the advanced training that these space professionals get. They go to the Navy Postgraduate School and other advanced civil schooling. They're very well-trained.

We've deployed now our 60th Army space support team rotation in support of forces in Iraq and Afghanistan. They provide reachback capability to those forces to access the space capabilities that our joint forces provide. They are a very essential part of what

it is we do. We maintain the capability to continue that rotation. They get the support that they need, and they're clearly a capability that operational commanders seek when they get ready to deploy.

Senator NELSON. Thank you.

Dr. Zangardi and Admiral Titley, as I mentioned in my opening statement, last year the first MUOS satellite was expected to launch in September of this year. Now it looks like the first satellite will not launch until mid-2012. In your prepared statement you indicate that there's an issue with scheduling the launch. Is that the only reason for the delay, and what is the cost of the delay, both in terms of dollars and operational capacity?

Dr. ZANGARDI. Yes, sir. Thank you for the question, sir. We project that the launch will occur in February 2012. We've been provided with a launch slot and that was firmed up a few months ago. The on-orbit capability for the first space vehicle of MUOS will be available in May 2012.

As far as the cost for that delay, we'll have to take that as a question for the record. I'm not prepared to answer that today.

[The information referred to follows:]

In March 2011 the assignment of Mobile User Objective Satellite (MUOS) 1 to a February 2012 launch slot was finalized by the Air Force as the earliest slot available since higher-priority National Aeronautics and Space Administration missions had been assigned to August 2011 and November 2011 launch slots. Current Ultra-High Frequency (UHF) Follow-On (UFO) availability models project that the UFO constellation will meet its availability requirement beyond MUOS 1 On-Orbit Capability in May 2012, so no impact to operational capacity is expected. The program incurred an additional cost of approximately $3.7 million due to the extension of contractor program management and system engineering effort for 4.5 months.

Senator NELSON. Okay. Is there any danger that that program might experience a Nunn-McCurdy breach?

Dr. ZANGARDI. Sir, in my view, and having talked with the program manager extensively before coming here, our view is that it will not at this point in time.

Senator NELSON. Is there anything that could cause that to happen that you're aware of?

Dr. ZANGARDI. Sir, at this time there's nothing that I'm aware of that could cause that. That does not preclude the possibility that something can occur, because, as we know, space is very complicated.

Senator NELSON. Admiral Titley, how do you approach this from your perspective?

Admiral TITLEY. Yes, sir, Senator. Thank you for the question. As we look at the amount of UHF capability that is in orbit today and how between a combination of some legacy Fleet Satellite Communication Systems, some leased satellites, and some Skynet as well as our UFO constellation, we believe that we will have in excess of 70 percent of that constellation still available by the time that the first MUOS bird achieves on-orbit capability in May 2012.

There's a number of reasons for that. STRATCOM has worked very hard along with the UFO program office. We have been able to squeeze more capability out of the existing constellation. We're careful on how we reprioritize. We've been careful with how we've used the leases. That has us to the point where we believe we will

have again in excess of 70 percent of our capacity, which is the benchmark, by the time MUOS No. 1 achieves on-orbit capability.

Thank you, sir.

Senator NELSON. What are your thoughts about a potential Nunn-McCurdy breach?

Admiral TITLEY. I would just echo Dr. Zangardi's comments there, sir. From my perspective, I have not seen anything from the program briefs that at this point in time trigger that concern. As Dr. Zangardi said, this is something you always have to keep watching for.

Senator NELSON. Thank you.

Senator Sessions.

Senator SESSIONS. General Shelton, Ambassador Schulte, and Ms. Chaplain, over the 5-year Future Years Defense Program budget for 2012, the cost for space launch vehicles has risen. Last year the budget called for 26 launch vehicles from fiscal year 2012 to fiscal year 2016 at a cost of $6.4 billion. This year's budget for the same time period reduces the number of launch vehicles by three, but the cost appears to have risen from $6.4 billion to $9.8 billion. That's three less rockets, but a $3.4 billion increase in cost.

How much of this price increase is related to the cancellation of the National Aeronautics and Space Administration's (NASA) Constellation program, which I know is some of it, and a lack of a clear NASA pathway for heavy lift? Would you comment on that?

Ambassador SCHULTE. Senator, I'd be glad to. First, we need to start with an economic order quantity buy of piece parts for the rockets that started with the beginning of the EELV program. When we first started that program, we thought we were going to have a very robust commercial launch market. The vendors went out, bought a lot of parts, and got good deals on the buys of those parts. We are entering the end of those parts and it's time to buy new.

We're buying smaller quantities. A lot of the vendors that we used before are no longer in business. In terms of the cost of upper stages, individual components that go on larger components, those prices have increased, as well as the engines for the rockets themselves.

As we go through with this new strategy to buy eight rockets per year, five for DOD, three for the National Reconnaissance Office, we will try to bring those costs down by going at it with a much more fixed-price mindset and again get back to an economic order quantity capability for the United Launch Alliance, our launch provider, and get down to lower costs as much as we can.

This is just a relatively small market that we're in here and it's just very difficult to contain the costs, but we're working hard at it.

Senator SESSIONS. The Air Force is dependent and required to provide the entire support now that NASA has reduced its play, participation, and consumption, NASA used to consume 70 percent of this capability. Has that impacted the price for the Air Force?

Ambassador SCHULTE. Senator, you're talking about the solid rocket capability?

Senator SESSIONS. Right.

Ambassador SCHULTE. We're not a big player in the big solid rocket business. That's the business of the strategic programs of the Air Force and the Navy, the strategic missile programs. In the space launch business we use liquid propulsion.

Senator SESSIONS. Ms. Chaplain, would you like to comment on that, please?

Ms. CHAPLAIN. Yes. Specifically about the engines, their effect on price, and what's going on in the NASA Constellation program. I do believe the engine prices are supposed to be increasing because there is a lot of uncertainty of what NASA's going to do in terms of the Constellation program and that could be factoring into the prices considerably.

When will we know what NASA's going to be doing? It should be this year, but there's still a lot of unknowns about how NASA's going to answer its own authorization requirements. The Senate Commerce Committee laid out an architecture that it desires to see and NASA has not come back yet and answered how they're going to answer that architecture.

We still have uncertainty and until that certainty comes it's likely that those engine prices are going to be higher.

Senator SESSIONS. I agree. I talked to one of the Chief Executive Officers involved in this said the number one thing going on in our supply base right now is uncertainty, and really it's uncertainty on what NASA is going to do. So we're trying to work on that problem.

Let me ask this. In their mark of the National Defense Authorization Act for Fiscal Year 2012, the House Armed Services Committee chose not to fund MDA's request for $160.8 million for the Precision Tracking Space System (PTSS). I talked to General O'Reilly about that and he is concerned that this is a decision that could increase costs.

Ms. Chaplain, the MDA programs are part of your GAO portfolio. Do you have any concerns with the MDA's strategy for PTSS or MDA leading the acquisition of a major space system?

Ms. CHAPLAIN. A couple months ago in our MDA report we reported on the PTSS program along with all the other MDA systems, and it's still fairly early in the program. We did note that the program is adopting some practices that we like to see in space programs, one being that they want to build prototypes before operational satellites.

Senator SESSIONS. In other words, DOD would basically build the prototypes and own the proprietary data, the patents or the rights to procure?

Ms. CHAPLAIN. Yes. They would be working with the U.S. Naval Research Laboratory and the Johns Hopkins Applied Physics Lab up the road, the two labs, to build prototype satellites. It's unclear whether the prototypes are going to be what the operational satellites are going to end up being. It's also something else we're trying to pursue as to the extent to which the schedules for developing the prototypes overlap the operational satellite schedules; are we giving enough time there to actually learn from the prototypes and feed that into the subsequent effort by contractors?

The other thing MDA has been trying to do that we thought was good, is keep requirements simple for PTSS. There are pressures and ideas for other things that PTSS could do.

We do have a concern about capability in terms of managing the large space program at MDA in terms of broader workforce issues across DOD and are we stretching the space workforce and the acquisition capability for space a little too thin. We haven't reported on that issue and we haven't done enough exploration about what MDA has versus what the Air Force has to be able to make reasonable comparisons.

Senator SESSIONS. Mr. Chairman, I would just say that it's possible the House didn't have all the information that's necessary on this system. General O'Reilly suggests that it could actually save a lot of money and get more capability.

General Shelton, do you have any thoughts about that, briefly?

General SHELTON. Senator, I talked to General O'Reilly just before coming over here and by what he has shown me it looks like a very capable system. Certainly not my area, but in terms of the way he described the capability and what it brings to missile defense and potentially to space situational awareness as well, it looks like a very valuable capability.

Senator SESSIONS. Thank you. It may be that we can work together to determine what would be the best thing to do, because a satellite could do more than other systems at less cost.

General FORMICA. Senator Sessions, would it be appropriate for me to comment?

Senator SESSIONS. Please.

General FORMICA. I actually speak from my operational perspective as STRATCOM's JFCC for Integrated Missile Defense. I can't speak to the programmatics of the PTSS. I will leave that to General O'Reilly. But the operational implications of having PTSS or a capability like that is the ability to defend against larger raid sizes. It has increased capability. It would reduce our reliance on terrestrial-based radar systems which require host nation basing agreements, or even airborne platforms that require air space. It's a persistent satellite-based contributor to the missile defense and would provide quality control tracking data that we would need.

It is a viable capability and there are operational implications to not having it. Again, I'll defer the programmatic discussions to General O'Reilly.

Senator SESSIONS. Briefly, he indicated that it has exceeded your expectations when you started with that program technologically?

General FORMICA. We know that the Space Tracking and Surveillance System, which is its predecessor capability, was recently successful in being able to transmit data during the flight test mission-15 a couple weeks ago.

Senator NELSON. Thank you, Senator Sessions. I have to go to the White House following the vote, but I'll be glad to leave this open and it will be in your very capable hands.

Senator SESSIONS. Thank you. I appreciate this panel. I might have a question or two and then we'll wrap it up.

Senator NELSON. That sounds fine.

Senator SESSIONS. Thank you, and make sure you figure a way to balance that budget, and not on the backs of the military.

Senator NELSON. I'll do my best.

Senator SESSIONS [presiding]. Thank you.

General Shelton, in January the Deputy Secretary of Defense voiced significant concerns to the Chairman of the Federal Communications Commission (FCC) regarding the FCC's provisional authorization of LightSquared's new wireless broadband proposal and the potential for interference with GPS signals, which our DOD relies on in a lot of different ways.

Secretary Lynn states that there's a "strong potential for interference to these critical national security systems," and that "DOD strongly recommends the FCC defer final action until proper interference analysis and mitigation studies can be conducted."

Do you agree with the concerns expressed by Secretary Lynn and what are the national security implications if we have interference problems?

General SHELTON. Senator, at the time he signed that letter and a subsequent letter in March, we had analytical data from an equipment manufacturer and some of the information that our program office in Los Angeles had been able to gather. We have since conducted actual testing using LightSquared's equipment, civil, commercial, and military GPS receivers at Kirtland Air Force Base. Although the data is still being analyzed, I would tell you that the empirical data appears to be consistent with the analytical data.

Yes, sir, we have concerns for commercial, civil, and military applications.

Senator SESSIONS. People with a GPS in their car could have problems also?

General SHELTON. Yes, sir.

Senator SESSIONS. We have to look at these things as we go forward and I think it's very appropriate to ask FCC to look at it hard.

I realize the vote time is winding down. I thank all of you for your service. We believe in what you do. People do not appreciate the extent to which our space capabilities help sea, air, and land teams, unmanned aerial vehicles, Army squad leaders all over the world, and Navy ships and capabilities. It's an extraordinary thing that this Nation has accomplished. No nation in the world has ever achieved so much in this regard. It costs a good deal, but it saves a lot of money too in a lot of different ways in making our military more capable and requiring less support.

Thank you for your attendance. We will be submitting some written questions and I hope that you'll be able to answer those within the time required. Thank you.

We are adjourned.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR E. BENJAMIN NELSON

PROTECTING SPACE ASSETS

1. Senator NELSON. General Helms, to protect satellites, you have to know what you are protecting them from. Improving space situational awareness (SSA), including the ability to detect and determine interference, is one of your major responsibilities. There are many sensors that provide or could provide SSA data. One of the problems, however, is the Joint Space Operations Center (JSpOC) Mission System (JMS), that utilizes this data to provide meaningful information is old and no longer able to handle the available data. Upgrading this system has proven to be an acquisition challenge. What is your vision for how this system should work?

General HELMS. My vision for the JMS is that information technology be a modern, scalable, service-oriented architecture that is capable of collecting, processing,

displaying, and disseminating data across multiple security levels. Information technology should be able to receive and transmit data to and from current and future military, commercial, and allied sources to enable rapid, proactive decisionmaking and effective operations.

To do this effectively JMS should be designed on an open architecture with an efficient, user-definable interface. Information technology should be easily expandable in terms of capacity, throughput, and storage. Its interfaces with all space systems and current and future SSA sensors should be efficient and effective. Finally, JMS must be net-centric to enable distributed operations, rapid dissemination of information, and continuity of operations.

To achieve this, the acquisition process must allow for rapid identification, development, testing, integration, and operation of new capabilities to address emerging threats and to support current, future, and unanticipated future missions. Close collaboration with the user is key. The legacy systems have been primarily focused on integrating space surveillance metric track data. JMS, as a modern, flexible, and extensible platform, should be able to incorporate additional intelligence and non-Space Surveillance Network data to enhance the JSpOC's ability to collaborate with mission partners to identify and characterize threats interfering with U.S. space assets.

2. Senator NELSON. General Shelton, you recently made a decision to take a pause in developing a new JMS, and move the acquisition responsibility to the Space and Missile Systems Center. What was your reasoning behind that decision and what impact does this have on new operating capability?

General SHELTON. The combination of the JMS program cost estimate growth to $1 billion or more and the required sustainment of legacy systems until 2019 levied an unacceptable risk to space operations and the Air Force Space Command (AFSPC) budget. In January 2011, the Office of the Secretary of Defense for Acquisition, Technology, and Logistics (OSD AT&L) directed an Independent Program Assessment (IPA) of the program. Although the IPA found the operational needs and system requirements compelling, information technology found the current acquisition strategy and approach inadequate. The IPA made several recommendations including a revised acquisition strategy and the extension of the prototyping phase to provide critical capabilities and reduce the risk for an agile information technology strategy.

The IPA results provided an opportunity for a strategic pause, and the Air Force and the Office of the Secretary of Defense (OSD) evaluated potential courses of action that would incorporate the IPA recommendations. The result is an approach that fully leverages multiple prototype development efforts while capitalizing on the initial JMS service-oriented architecture and user-defined operational picture. This approach will provide early-use capability, allow JMS to provide more timely space effects, and utilize new data sources quicker. Information technology allows decommissioning of the legacy SSA systems soonest, avoiding an extended legacy sustainment bill. Finally, information technology establishes rigorous systems engineering and test and training processes early, enabling successful rapid integration.

In evaluating the JMS course of action, information technology was also determined the Space and Missile Systems Center (SMC) was best suited to conduct this acquisition. Among SMC's core competencies is SSA which is the foundation of the capabilities we must deliver in JMS. The impact is key mission capability delivered to the warfighter sooner.

3. Senator NELSON. General Hyten, in your view is the acquisition system simply not structured to buy a new JMS, and if not, what has to change?

General HYTEN. Air Force leadership agrees with the 2009 Defense Science Board (DSB) Task Force report on the Acquisition of Information Technologies that there are challenges associated with acquiring agile information technology under the current Department of Defense (DOD) 5000.02 acquisition policy. The DSB concluded that, "The conventional DOD acquisition process is too long and too cumbersome to fit the needs of the many systems that require continuous changes and upgrades—a reality driven by the short half-life of commercial information technology, supportability of hardware (which is often a commodity), software applications, and operational requirements."

DOD is progressing toward developing a new acquisition process for information capabilities (as initially described in the November 2010 report to Congress titled, "A New Approach for Delivering Information Technology Capabilities in the Department of Defense"), that embraces the tenets of section 804, paragraph (b) of the National Defense Authorization Act (NDAA) for Fiscal Year 2010, to include: (1) early and continual involvement of the user; (2) multiple, rapidly executed increments or

releases of capability; (3) early, successive prototyping to support an evolutionary approach; and (4) a modular, open-systems approach. A new policy designed with these tenets in mind will provide DOD and the Air Force the flexibility to develop agile information technology while providing the foundation and structure to ensure programmatic success and fiscal responsibility.

In January 2011, OSD AT&L directed an IPA of the JMS program. Although the IPA found the operational needs and system requirements compelling, information technology found that the JMS acquisition has not incorporated agile information technology acquisition practices.

JMS is being restructured to better implement these concepts and has been reassigned to Program Executive Office (PEO) Space at SMC. SMC is synergistically aligned with AFSPC and 14th Air Force and has the requisite space domain expertise. They will be better poised to successfully develop this critical space capability in the timeframe necessary to migrate off the increasingly unsustainable legacy systems.

4. Senator NELSON. General Helms, as the Joint Functional Component Commander for the U.S. Strategic Command (STRATCOM), you work with commercial space companies and other countries to share SSA data. You mentioned in your statement that there are now 23 data sharing agreements in place. How is the data sharing working in practice, is information technology valuable, is the data reliable, are you seeking additional agreements, and are there any implementation problems?

General HELMS. As of 1 June 2011, we have 24 signed SSA Sharing Agreements. The program is working very well. Companies with agreements submit data requests directly to Joint Functional Component Command for Space (JFCC Space), and if the request is consistent with national security interests and we have the resources available, we provide the information to the company. Additionally, as an emergency service, we provide all global operators with alerts when there will be a close approach between their satellites and other objects. Data sharing is invaluable to our space operations. It has improved our SSA, increased our capabilities, and resulted in greater cooperation between allied, coalition, and commercial partners. Our partnerships have allowed us to better understand domestic and international commercial space operations and processes to include satellite status, orbit maneuver plans, and launch windows and parameters; information that would have been almost impossible to get without these agreements in place. These agreements will be even more important as space becomes more congested, competitive, and contested. For example, companies notify us of planned maneuvers and launches which enables us to proactively posture sensors for tracking and understand a change in status before it occurs, rather than reacting to events. This program is extremely valuable as an example of U.S. leadership and international confidence-building.

Data reliability is good and getting better. We receive operator information, compare it to our own, and incorporate the useful information. Demand for SSA sharing services is growing. We are currently talking with two additional interested companies and we will begin entering agreements with international governments once we receive Department of State (DOS) and DOD approval.

5. Senator NELSON. General Helms, there are many other sensors that could provide SSA data that are not currently incorporated to the JSpOC. AFSPC is providing a small amount of operational support to an array of radio receivers to determine if these privately owned receivers could provide additional SSA. Could you look into these and provide your thoughts?

General HELMS. The Allen Telescope Array (ATA) is capable of providing SSA data that could supplement current sensors, track transmitting satellites without disruption from the sun or most weather, and provide a "special event" RF observation capability. Air Force Tactical Exploitation of National Capabilities has successfully demonstrated that the ATA can provide position data on transmitting satellites and conduct secure direct-to-disk observations. We are always interested in ways to improve our SSA capabilities and the surveillance network. We support AFSPC desire to further assess ATA through a military utility assessment to determine the benefit it could provide to SSA and whether such a capability could be provided in a cost effective manner.

MOBILE USER OBJECTIVE SYSTEM SATELLITE

6. Senator NELSON. General Helms, as I mentioned in my opening statement, last year the first Mobile User Objective System (MUOS) satellite was expected to

launch in September of this year, now information technology looks as if the first satellite will not launch until mid-2012. If the launch of the first MUOS is late solely as a result of congestion in the launch schedule, what is the plan to manage the schedule?

General HELMS. Satellite vehicles are assigned launch slots as early as 24 months in advance. If they fail to meet these slot dates, a backup will be scheduled in its place and the satellite vehicle will have to compete for subsequent launch slots based on booster availability and national priorities.

The MUOS–1 launch was delayed when the satellite vehicle did not complete thermal vacuum testing on time, a major processing milestone. Launch slot priority was given to a mission more likely to meet the launch slot date. Unfortunately, the next two launch slots support National Aeronautics and Space Administration's (NASA) two inter-planetary missions scheduled to launch from Cape Canaveral Air Force Station with fixed launch windows and no launch opportunity between the two missions. The length of MUOS–1 delay is based on booster availability and national priorities rather than congestion.

MUOS–1 is currently scheduled for the February 12, 2012, Atlas V launch slot.

7. Senator NELSON. General Helms, how are launch priorities determined?

General HELMS. The quarterly Current Launch Schedule Review Board integrates a wide range of inputs to determine the Current Launch Schedule (2 year schedule). Inputs are received from AFSPC, the Federal Aviation Administration (FAA), NASA, National Reconnaissance Office (NRO), STRATCOM, Constellation Sustainment Assessment Teams (CSAT) and other organizations who have spacecraft preparing to launch. Launch priority is then based on all inputs, national priorities, and satellite/launch vehicle readiness to meet assigned launch dates.

ACQUISITION LESSONS LEARNED

8. Senator NELSON. Ms. Chaplain, you and your colleagues at the Government Accountability Office (GAO) have spent many years following space acquisition programs. As most of these challenging programs are on the cusp of operations, what are the lessons learned from years of late and over budget programs?

Ms. CHAPLAIN. Key lessons on acquiring space systems have been learned the hard way over the past decade. These lessons mirror many of the best practices identified in our prior reports. Principally, information technology is vital that programs start with as much critical knowledge on requirements, technology, schedule, and cost as possible, and that they not be allowed to move into more complex phases of development without demonstrating that defined levels of knowledge have been attained. Most of the programs that have experienced significant delays and overruns lacked critical knowledge at the start and throughout. Another key lesson is that programs be set up in achievable increments versus revolutionary advances. In other words, not every military satellite initially needs to serve all the needs of multiple communities. Lastly, while acquisition "reform" and adopting "commercial" practices intuitively seem like the right things to do, DOD has learned that information technology needs to stay knowledgeable and involved in its acquisition efforts and provide adequate oversight. Many of the problems we have identified in the past decade can be linked back to reform initiatives that loosened oversight, quality standards, and government involvement. Table 1 highlights practices we have recommended that could benefit space programs.

Table 1: Actions Needed to Address Space and Weapon Acquisition Problems

Before undertaking new programs:

- Prioritize investments so that projects can be fully funded and information technology is clear where projects stand in relation to the overall portfolio.
- Follow an evolutionary path toward meeting mission needs rather than attempting to satisfy all needs in a single step.
- Match requirements to resources—that is, time, money, technology, and people—before undertaking a new development effort.
- Research and define requirements before programs are started and limit changes after they are started.
- Ensure that cost estimates are complete, accurate, and updated regularly.
- Commit to fully fund projects before they begin.
- Ensure that critical technologies are proven to work as intended before programs are started.

• Assign more ambitious technology development efforts to research departments until they are ready to be added to future generations (increments) of a product.
• Use systems engineering to close gaps between resources and requirements before launching the development process.

During program development:

• Use quantifiable data and demonstrable knowledge to make go/no-go decisions, covering critical facets of the program such as cost, schedule, technology readiness, design readiness, production readiness, and relationships with suppliers.
• Do not allow development to proceed until certain thresholds are met—for example, a high proportion of engineering drawings completed or production processes under statistical control.
• Empower program managers to make decisions on the direction of the program and to resolve problems and implement solutions.
• Hold program managers accountable for their choices.
• Require program managers to stay with a project to its end.
• Hold suppliers accountable to deliver high-quality parts for their products through such activities as regular supplier audits and performance evaluations of quality and delivery, among other things.
• Encourage program managers to share bad news, and encourage collaboration and communication.

Source: GAO.

9. Senator NELSON. Ms. Chaplain, do you see these lessons being applied to new programs, such as the Defense Weather Satellite System (DWSS)?

Ms. CHAPLAIN. In general, DOD is working to ensure that critical technologies are matured before large-scale acquisition programs begin, requirements are defined early in the process and are stable throughout, and system design remains stable. DOD also intends to follow incremental or evolutionary acquisition processes versus pursuing significant leaps in capabilities involving technology risk and has done so with the only new major satellite acquisition program undertaken by the Air Force in recent years—GPS IIIA. DOD is also providing more program and contractor oversight and putting in place military standards and specifications in its acquisitions. Additionally, DOD and the Air Force are working to streamline management and oversight of the National Security Space Enterprise. Regarding DWSS, we have not conducted a detailed review of the development effort to determine the extent to which lessons learned are being applied.

FUTURE FOR OPERATIONALLY RESPONSIVE SPACE

10. Senator NELSON. Ambassador Schulte and General Shelton, the Operationally Responsive Space (ORS) Office has had several successful space efforts, including TACSAT–3, demonstrating the military utility of small satellites to the warfighter. Two more small satellites, TACSAT–4 and ORS–1, should be launching shortly. What are your views on the future utility of small satellites from an operational and a policy perspective?

Ambassador SCHULTE. Small satellites can play a role in making our space architectures more resilient and in providing tailored capabilities to the warfighter, goals that help fulfill several strategic approaches in the National Security Space Strategy (NSSS). Resilient architectures contribute to deterring aggression against space infrastructure that supports U.S. national security, and provide a means to operate in a degraded environment should deterrence fail. One approach to improve resilience is to disaggregate specific missions or payloads, and satisfy requirements by flying multiple smaller satellites. Smaller, more responsive space capabilities also improve our ability to operate in a degraded environment by enabling the DOD to respond quickly to urgent needs or reconstitute a capability after it is lost. Small satellites can also help address the challenges of our space industrial base, providing a steady requirement for many smaller satellites spread over many years and offering opportunities to incorporate new technologies and innovations rapidly.

General SHELTON. As you mentioned, the TACSAT–3 spacecraft built by the Air Force Research Laboratory has demonstrated the military utility of a hyper-spectral imaging sensor. We believe that both the Naval Research Laboratory TACSAT–4 and ORS Office/AFSPC ORS–1 spacecraft will provide unique capabilities to the warfighter and useful data regarding small spacecraft performance.

The National Space Policy (NSP) directs DOD to develop and exercise capabilities and plans for operating in and through a degraded, disrupted, or denied space environment. We need to think about new ways to field our future satellite constellations in terms of higher resiliency and increased assurance. Smaller satellites may be one approach to the problem. There may be other creative ways to disaggregate capabilities or distribute sensors and networks to provide adequate space capabilities. Many applications, such as communications, navigation, or missile warning, require a constellation of spacecraft to provide persistent global coverage. In the future, a strategy of greater distribution of spacecraft constellations, responsive launch for critical capabilities and/or on-orbit spares may provide needed resilience in a contested space environment.

11. Senator NELSON. General Formica, the Army has been putting a lot of effort into small satellites, including a small satellite called Kestrel Eye. What is driving this attention on small satellites?

General FORMICA. Space capabilities are required for the Army to shoot, move, and communicate. Small satellites have the potential to provide responsive and cost effective alternatives to augment existing space capabilities. With the changing nature of ground warfare, this added capability would provide the potential for persistent communications and intelligence, surveillance, and reconnaissance to warfighters at the tactical level, including those in remote locations.

EXPORT CONTROLS

12. Senator NELSON. Ambassador Schulte, the International Traffic in Arms Regulations restrictions on the export of space-related technologies, many of which are global commodities today, have had a negative impact on the U.S. space industrial base—especially on lower-tier suppliers. The new NSSS acknowledges this situation and states the need for export control reform. What is the status of these export control reforms?

Ambassador SCHULTE. On May 6, 2011, DOS and DOD transmitted a joint interim report to Congress in response to section 1248 of the NDAA for Fiscal Year 2010. The "Risk Assessment of United States Export Control Policy" report is a conservative starting point for transferring satellites and related items from the United States Munitions List (USML) to the Commerce Control List (CCL). It recommends that, under certain conditions, commercial communications satellites, systems, subsystems, and components be controlled on the CCL. In addition, the report recommends that the President be provided with the authority to determine the export licensing jurisdiction of satellites and related components, which are currently required by statute to be on the USML.

A more comprehensive assessment of controls on satellites, related items, and technology is currently underway, as part of the administration's Export Control Reform (ECR) initiative. DOD, with its interagency partners, is expected to complete this review of USML Category XV, Spacecraft Systems and Associated Equipment, by July 2011. The draft will include recommendations for what items should remain on the USML and what items can be moved to the CCL. No items controlled on the USML by statute will be moved off that list unless and until the authority to do so is provided by Congress.

We expect to provide the final section 1248 report to Congress later this year, based on the findings from the ECR initiative. Implementation of the interim report's recommendations would represent a significant step forward in export control reform for satellites, which we hope will boost U.S. content in foreign satellites, increase opportunities for partnering with foreign manufacturers, and help energize the U.S. space industrial base.

SPACE SCIENCE AND TECHNOLOGY STRATEGY

13. Senator NELSON. Dr. Zangardi and Admiral Titley, the NDAA for Fiscal Year 2010 directed the Secretary of Defense and the Director of National Intelligence to develop a Space Science and Technology (S&T) Strategy, which was recently delivered to Congress. Is the Space S&T Strategy being used by the Navy to guide or inform investments in space systems?

Dr. ZANGARDI and Admiral TITLEY. Yes, the Office of Naval Research's and Naval Research Laboratory's current space capability development efforts are focused on the following DOD Space S&T Strategy goals: (1) Satellite Communications including communications-on-the-move; dedicated/theater controlled, space-enabled tactical communications; enhanced flexibility and resilience in challenged environ-

ments; and support to ISR collection platforms (e.g., TACSAT–4 communications satellite (scheduled to launch 27 September 2011)); (2) Intelligence, Surveillance, and Reconnaissance (ISR) including increased persistence of space-based ISR and improved cross-cueing for space-based assets (e.g., Detection and Fusion of Remote Sensors Future Naval Capabilities Initiative)); and (3) Space Environmental Monitoring including improved understanding and awareness of the Earth-to-Sun environment; improved space weather forecast capabilities and tools to predict operational impacts; and improved space weather forecasting and enabling real-time threat warning (e.g., a Space Weather Discovery and Invention Initiative.) These efforts illustrate the Navy's application of this strategy as a tool to guide its space S&T initiatives and investments.

14. Senator NELSON. General Shelton and General Hyten, is the Space S&T Strategy being used by the Air Force to guide or inform investments in space systems?

General SHELTON and General HYTEN. The report was completed less than 2 months ago and is still being reviewed by our organizations. Air Force inputs were primarily provided by the Air Force Research Laboratory and they were consistent with the outputs from yearly S&T reviews conducted by the Air Force Space Command Commander, the Air Force Research Laboratory Commander, and the Space and Missile Systems Center Commander.

15. Senator NELSON. General Formica, is the Space S&T Strategy being used by the Army to guide or inform investments in space systems?

General FORMICA. Yes, the Space S&T Strategy is being used by the Army to guide our investments in space systems. The strategy captures and reflects the guidance set forth to the Army outlined in the NSP and the NSSS regarding priorities and investment strategies for space.

16. Senator NELSON. Ambassador Schulte, do you know who in DOD will be responsible for oversight of the execution of the strategy?

Ambassador SCHULTE. The Assistant Secretary of Defense for Research and Engineering is responsible for oversight of the execution on the Space S&T Strategy.

SPACE LAUNCH

17. Senator NELSON. General Hyten, what is the Air Force plan to reduce launch costs, and rethink how launch vehicles are purchased, particularly the Evolved Expendable Launch Vehicle (EELV)?

General HYTEN. The recently appointed Air Force PEO for Space Launch is crafting a new EELV acquisition strategy that supports a minimum production rate by implementing a lot-buy approach to procuring launch vehicles. This strategy also includes a "new entrant" approach to allow for near-term opportunities and future competition in all lot buys. The Air Force, NRO, and NASA are working together to develop and publish a coordinated strategy for certification of new entrants, targeted to begin in fiscal year 2013. Key elements of the strategy are an initial Atlas V and Delta IV lot buy of sufficient size to ensure economic order quantity prices and a steady launch vehicle production rate. An AF/NRO study team and the Broad Area Review 2010 recommended an annual minimum production rate of eight launch vehicle cores plus associated upper stage engines, payload fairings, and solid rockets to sustain our spacelift industrial base. With lot buys, a steady production rate, and a "new entrant" approach, we believe launch costs can be controlled.

18. Senator NELSON. Ms. Chaplain, GAO has an ongoing review of the development of the new EELV acquisition strategy. When will this review be completed and do you have any preliminary thoughts on how to reduce launch costs?

Ms. CHAPLAIN. We plan to issue a report on the results of our EELV review in July 2011. In this review we are examining whether DOD has the knowledge and information technology needs to develop a new EELV acquisition strategy and the extent to which there are important factors that could affect launch acquisitions. Given concerns raised through recent studies about visibility into costs and the industrial base supporting EELV, information technology is important that this strategy be supported with reliable and accurate data. Without such data, efforts to manage launch costs may not be effective. Additionally, deficiencies in the space acquisition workforce in general and those in the Air Force's Launch and Range Systems Directorate in particular, increase the challenge of implementing the new strategy effectively.

19. Senator NELSON. General Shelton and General Helms, what do you see as the advantages and disadvantages to having new launch providers?

General SHELTON. There are two advantages: (1) new providers may be able to bring innovative approaches that result in lower costs, and (2) creating competition in space launch. The disadvantage we have identified thus far is that the launch market may not be sufficiently robust to support multiple providers at efficient production levels.

General HELMS. The advantages of a new provider for space launch are innovative approaches with lower costs. Additionally, competition provides incentive for current providers to find ways to lower costs. At any point in time, a more experienced provider will be perceived to have a matured reliability advantage over a less experienced launch provider. If a new launch provider experiences "growing pains" while establishing its position in the launch business, it may expose the government to unique schedule, cost, and performance risk.

20. Senator NELSON. General Shelton and General Helms, what are the general performance objectives and goals that you would want to see from an operational perspective to ensure that a new launch provider can successfully launch a satellite?

General SHELTON. Our current requirements documents state that a launch provider must be able to meet the range of lift requirements to launch national security payloads and demonstrate launch vehicle reliability of 98 percent or better. The launch vehicle must adhere to standard interface specifications to enable spacecraft to fly on the new rocket without being redesigned, and it must be able to launch from both the east coast and the west coast. We are evaluating new entrant criteria to encourage competition and allow a path for new launch providers to certify readiness for national security missions.

General HELMS. Our requirements are specified in the EELV operational requirements document. For example, a new provider must be able to meet the variety of lift requirements to launch national security payloads and demonstrate launch vehicle reliability of 98 percent or better. The launch vehicle must adhere to the EELV standard interface specification to enable spacecraft to fly on the new rocket without being redesigned and be able to launch from both coasts.

As a goal, the new provider should be able to deliver lower cost launches and bring long-term stability to Air Force launch services.

DEFENSE WEATHER SATELLITE SYSTEM

21. Senator NELSON. General Hyten, in February 2010, the President restructured the National Polar-orbiting Operational Environmental Satellite System (NPOESS) weather satellite program. This decision directed the acquisition and development of separate military and civil weather satellite programs for the Air Force and the National Oceanographic and Atmospheric Administration (NOAA), rather than the joint NPOESS program. NPOESS had experienced technical problems that had resulted in cost and schedule increases and had a management structure that was not workable. The Air Force plans to acquire the DWSS to satisfy military weather requirements, and the NOAA will acquire the Joint Polar Satellite System (JPSS). Both NOAA and the Air Force will continue to use a shared common ground system to address weather and environmental requirements. The DWSS program is expected to launch two satellites with the first launch in 2018. What is the status of the DWSS effort?

General HYTEN. The DWSS program is proceeding according to last year's plan. The Air Force retained the NPOESS prime contractor, Northrop Grumman Aerospace Systems (NGAS) and modified the contract for DWSS development. This restructured contract was awarded on 24 May 2011. The Air Force also transitioned the NPOESS climate sensors and the common ground system from the NPOESS contract to NOAA/NASA to support development on the JPSS contracts.

DWSS is the result of a presidentially-directed restructure, not an NPOESS termination, and is consequently bound to the NPOESS acquisition baseline for annual acquisition reports to Congress. As a result, the restructure led to a significant Nunn-McCurdy breach of the NPOESS Program Acquisition Unit Cost. This breach was detailed in the 15 April 2011 NPOESS Selected Acquisition Report (SAR) and a 29 April 2011 notification to Congress by the Secretary of the Air Force.

This year the Air Force and NGAS are focused on early development of the two DWSS satellites, finalizing contract restructure efforts, and completing the transition of non-DOD payloads to NOAA/NASA for JPSS. DWSS development activities will ramp-up considerably over the next year. Significant planned efforts in 2012 include continued spacecraft redesign to a smaller and lighter bus, continued develop-

ment of the two primary sensors—the Visible/Infrared Imager Radiometer Suite and Microwave Imager Sounder—and development of algorithms to satisfy DOD-specific requirements in the common ground system. Following Milestone-B approval by the Defense Acquisition Executive in early 2012, the contractor will conduct the Preliminary Design Review in late 2012.

The DWSS program is still on track to launch the first DWSS spacecraft no earlier than 2018.

22. Senator NELSON. General Hyten, we have heard that a major program review of DWSS has been postponed indefinitely because of scheduling issues. What is the status of and schedule for the program review?

General HYTEN. The DWSS Program Review Defense Acquisition Board (DAB) was replaced by a program update to the Defense Acquisition Executive, Dr. Carter, which was held on 31 March. This update provided Dr. Carter with a summary of the program's annual SAR delivered to Congress on 15 April and also addressed acquisition schedule, contract status, and sensor design.

23. Senator NELSON. Ambassador Schulte, Earth environmental monitoring, weather sciences, and related technologies were not included in the 2011 Space S&T Plan. Do you know why these technologies were omitted?

Ambassador SCHULTE. Historically, the vast majority of DOD S&T programs that address meteorological and atmospheric issues have not been considered a part of the Space S&T domain. However, future Space S&T strategies will more clearly identify significant space-specific S&T goals in Earth environmental monitoring, weather sciences, and related technologies.

The Space S&T Strategy's ISR core mission area incorporates DOD-funded S&T for sensors, electronics, and modeling, including terrestrial, atmospheric, and space weather. These S&T efforts support development of future technology options that address military needs in the ground, air, and space operational domains, including monitoring of seismic activity, typhoons, and the coastal ocean environments.

QUESTIONS SUBMITTED BY SENATOR JEFF SESSIONS

AIR FORCE SPACE ACQUISITION PROPOSAL

24. Senator SESSIONS. General Shelton and Major General Hyten, the Air Force has proposed an efficiency initiative to adopt a new method for acquiring satellites called Evolutionary Acquisition for Space Efficiency (EASE). We have recently heard that the Assistant Secretary of Defense for AT&L does not believe that the use of multiyear contracts to procure additional Advanced Extremely High Frequency (AEHF) assets is appropriate at this time. We understand, however, that AT&L is considering other, more conservative block buy approaches that may be more appropriate for buying high technology-risk military satellites. In pursuing this contracting strategy, what sort of accountability does the Air Force intend to place on the prime contractor of these satellite systems?

General SHELTON and General HYTEN. The best approach for accountability under EASE is the fixed-price, incentive fee contract. Once the contract is negotiated and put into action, the government's obligation is limited. Government liability is constrained if the contractor experiences problems directly related to the contractors' responsibilities within the scope of the contract. Contract penalties for unmet milestones or premature failure in on-orbit performance will also apply. Along with these provisions we hope to bring improved industrial base stability that will help avoid the conditions that have contributed to past cost overruns.

In addition, designating block buys as Subprograms will provide congressional insight into actual space vehicle block costs. The resulting visibility ensures Air Force and DOD accountability to the costs and funding requirements to which they committed at the block Milestone Decision.

25. Senator SESSIONS. General Shelton and Major General Hyten, given AEHF–1 has yet to reach its operational orbit and won't do so until August, why should Congress write the check now for two more until we know if the satellite works and can meet its intended requirements?

General SHELTON and General HYTEN. The AEHF program requirements are solid, the design is stable and mature, and the experienced government and contractor team is in place. We are making great progress on AEHF–1 orbit raising having reached the third of a four-phase revised orbit raising strategy and expect to have a full 14-year mission life. Once in the proper orbit, AEHF–1 checkout will

commence verifying that AEHF–1 can meet its intended requirements. In addition, AEHF–2 is in storage awaiting launch, and AEHF–3 and –4 are in various stages of production. The block buy of AEHF–5 and –6 will comprise a smooth continuation of the production line. Design maturity and stability lend well to a fixed-price contracting strategy for future production. If, for some unexplained reason, we discover unforeseen problems with AEHF–1, we believe they will be resolved before any final decisions are made concerning the production of AEHF–5 and –6.

26. Senator SESSIONS. General Shelton and Major General Hyten, shouldn't the Air Force be required to demonstrate the reliability of these systems before asking Congress to authorize buying these assets in bulk?

General SHELTON and General HYTEN. AEHF–1 is scheduled to reach GEO by October 2011 and commence the 6-month on-orbit checkout process. Barring any schedule changes, the Air Force will complete AEHF–1 on-orbit checkout by April 2012 and will have proven satellite reliability. The Air Force does not plan to award the AEHF–5 and –6 block buy contract before April 2012.

27. Senator SESSIONS. Ms. Chaplain, has the GAO reviewed the Air Force EASE strategy?

Ms. CHAPLAIN. While we have not yet fully assessed the EASE strategy, this new approach appears to offer various benefits, such as ensuring technologies are mature and requirements are stable, accruing cost savings from economic order quantities, supporting the industrial base, and reducing the workload burden on government acquisition program offices. However, the strategy also appears to pose several challenges, including the potential to limit competition and innovation, as well as developing accurate and reliable cost and schedule estimates for acquiring state-of-the-art satellites so that a fixed-price contracting strategy can be successfully employed. An overarching architecture could help implement and ensure the EASE strategy meets future needs. Additionally, a knowledgeable workforce would be essential for effectively implementing the strategy and developing adequate insight into costs and industrial base capabilities.

28. Senator SESSIONS. Ms. Chaplain, do you have any concerns, particularly about the use of multiyear contracts, to buy high technology-risk military satellites?

Ms. CHAPLAIN. Spreading the high procurement costs of satellites over several years should help to stabilize space system acquisition funding needs. However, the use of advance appropriations in conjunction with multi-year contracting would commit future budget authority for these procurements and thus tend to limit flexibility in future Congress' budget decisionmaking. For this reason, we remain more concerned with the use of advance appropriation than the use of multiyear contracts.

29. Senator SESSIONS. Ms. Chaplain, what other acquisition strategies should the Air Force consider that can both depressurize the appropriated funding vis-á-vis increasingly expensive satellite programs, but also allow the Air Force to procure high-risk space assets responsibly and in a way that allows for robust and meaningful congressional oversight?

Ms. CHAPLAIN. Similar to major satellite acquisitions, the Navy's major ship acquisitions are characterized by high cost items and low quantities. In some instances, the Navy procures its high cost ships by spreading procurement costs over multiple years without utilizing advance appropriations. A similar approach may be beneficial and applicable to procuring high cost satellites. Additionally, a strategy that calls for constellations of smaller and less technically complex satellites—such as single-mission satellites with shorter planned lifespans—could help DOD meet cost goals, bolster the space industrial base, allow capabilities to be fielded faster, and facilitate constellation sustainment in case of a launch or unexpected on-orbit failure. Finally, enterprise planning across the space acquisition programs portfolio could also significantly help normalize the spikes and valleys in space funding. Efforts under these scenarios would allow for robust and meaningful congressional oversight.

SPACE SITUATIONAL AWARENESS: JOINT SPACE OPERATIONS CENTER MISSION SYSTEM

30. Senator SESSIONS. General Shelton and Lieutenant General Helms, one of your top priorities is the development of a modern SSA system for analyzing and monitoring activity in space. I am concerned that the traditional defense acquisition process is not optimal for the development of software-based service-oriented architectures like the one envisioned for the JSpOC management system. I understand

that recently you decided to reevaluate the acquisition strategy for this program. What is the current status of the JSpOC management system?

General SHELTON. In January 2011, OSD/AT&L directed an IPA of the JMS program. Although the IPA found the operational needs and system requirements compelling, it found the JMS acquisition had not incorporated agile information technology acquisition practices.

The IPA recommended a revised acquisition strategy which included the extension of a prototyping phase to reduce the risk. The Air Force has now embarked on an approach that fully leverages multiple current prototype development efforts while capitalizing on the initial JMS service-oriented architecture capabilities. This approach will provide early-use capability, utilize new data sources quicker, and allow decommissioning of the legacy SSA systems soonest. Finally, it establishes rigorous systems engineering, test and training processes early, enabling successful rapid integration.

We are now in the process of transferring program responsibility to the SMC to implement this prototyping approach for more rapid delivery of mission capability to the warfighter.

General HELMS. In January 2011, OSD/AT&L directed an IPA of the program. Although the IPA found the operational needs and system requirements compelling, it found the current DOD acquisition policy, and therefore the JMS acquisition, has not properly incorporated agile information technology acquisition practices. The IPA recommended DODI 5000.2 (Operation of the Defense Acquisition System) be amended to reflect the Information Technology Box concept and incorporate DOD's section 804 response to Congress for agile acquisition.

In addition, the IPA recommended a revised acquisition strategy including the extension of the prototyping phase to reduce the risk for an agile information technology strategy. To comply, the Air Force is proposing an approach that fully leverages multiple prototype development efforts while capitalizing on the initial JMS service-oriented architecture and user-defined operational picture already at the JSpOC. This approach will provide early-use capability, utilize new data sources quicker and allow decommissioning of the legacy SSA systems soonest. Finally, it establishes rigorous systems engineering and test and training processes early, enabling successful rapid integration.

AFSPC is now in the process of transferring program responsibility to the SMC to implement this prototyping approach to more rapidly deliver mission capability for the JSpOC.

31. Senator SESSIONS. General Shelton and Lieutenant General Helms, what is the expected timeline and cost?

General SHELTON. We will transition off of legacy SSA core processing systems by the end of fiscal year 2014. The schedule for the remaining JMS capabilities is now being developed.

The total cost of the new rapid prototyping approach is expected to be less than the previous approach. We are finalizing the detailed program baseline and acquisition strategy.

General HELMS. We hope to transition off of legacy SSA core processing systems by the end of fiscal year 2014. The schedule for the remaining JMS capabilities is now being developed.

The new rapid prototyping approach, as informed by the OSD directed IPA, is expected to cost significantly less than the previous approach. At this time, detailed program baseline and acquisition strategy are still being finalized.

32. Senator SESSIONS. Ms. Chaplain, does GAO have any thoughts or insights on the JMS acquisition strategy?

Ms. CHAPLAIN. We have not reviewed the latest changes to the JMS acquisition strategy resulting from the recently-conducted IPA. However, in our review of the acquisition effort last year, we raised several concerns about the then-current draft JMS acquisition strategy including the following:

- The potential for deferring requirements could be an oversight consideration given the Air Force's history of consistently deferring requirements in previous attempts to upgrade information technology systems that support SSA.
- The JMS acquisition was not adopting an incremental approach—the effort instead consisted of a single increment delivered in a series of releases—as exemplified by its plans to proceed without knowledge of all critical technologies and deferral of other planning activities. This lack of knowledge could result in unanticipated costs and other programmatic risks to the acquisition effort.

• The program planned to award a contract for developing a high accuracy catalog without first conducting limited development or developing prototypes. The high accuracy catalog is foundational for most JMS capabilities and is intended to be a net-centric data repository of information about earth-orbiting objects.
• Support for use of a service-oriented architecture was relatively new under DOD policy and the practice was not yet widely used—although service-oriented architectures offer significant benefits, they also pose integration and information assurance challenges.

QUALITY CONTROL

33. Senator SESSIONS. Ambassador Schulte, Dr. Zangardi, General Shelton, Lieutenant General Helms, Lieutenant General Formica, Rear Admiral Titley, Major General Hyten, and Ms. Chaplain, contractor quality issues have had significant impacts on major defense space programs over the years. In your opinion, what more can be done to address quality control?

Ambassador SCHULTE. Energizing the space industrial base is one of the three strategic objectives of the NSSS. This includes working with the Intelligence Community and our industrial base partners to revalidate current measures and implement new ones, where practicable, to stabilize program acquisition more effectively, and to improve our space acquisition processes. Stabilizing our acquisition programs will allow prime contractors and suppliers to work over the long-term to increase quality. Suppliers will tend to provide higher quality where there is longevity to a production run.

DOD also needs to engage the supplier community more strategically about far-reaching issues concerning the industrial base. The existing Space Industrial Base Council is intended to serve this purpose and will be used to address this and other supplier issues as needs arise.

Dr. ZANGARDI and Admiral TITLEY. Navy's primary space responsibility is the procurement, sustainment, and operation of DOD's Ultra-High Frequency (UHF) communications satellites. While fulfilling this responsibility, it has been Navy's experience that a majority of the systems that comprise the current UHF constellation have operated well beyond their design lives. The satellites and their sub-systems are well engineered, so the Navy can't comment on negative impacts from quality control problems. Navy space programs leverage lessons learned from other space programs and utilize numerous proven quality control mechanisms that conform to industry standards. The Navy Communications Satellite Program Office along with our contractors are fully engaged in ensuring Navy space programs continue to produce high quality systems.

General SHELTON and General HYTEN. The Air Force, as a whole, continues to move away from the Total System Performance Responsibility (TSPR) approach to acquisition embraced in the mid-1990s. The crux of the TSPR approach was to transfer government tasks to the contractor in order to gain efficiencies by taking full advantage of the contractor's overall management approach and commercial best practices with minimal government oversight. As a result of minimizing that government oversight, critical acquisition and engineering skills within the Air Force atrophied resulting in less and less ability to provide quality oversight.

Today, the Air Force is aggressively improving its acquisition corps, to include focus on the systems engineering discipline. Robust up-front systems engineering, detailed design reviews, and continuous risk analysis and mitigation will design quality into the system from the beginning, rather than solely relying on quality control officials to validate checklist compliance during final production and integration. Robust systems engineering and acquisition oversight of contractor performance during the engineering phase will lead to the quality product we require for the warfighter.

We also believe stable production runs underwritten by stable funding will benefit the industrial base and enhance quality.

General HELMS. I believe there are a few ways we can improve quality control. First, we can increase contractor financial responsibility for poor quality control of subcontractor work. Second, provide contractor greater predictability for orders and production enabling the contractor to retain expertise. Third, we should make award fees large enough to incentivize contractor behavior. Finally, more block buy purchases with smaller steps in technologies will avoid large technological leaps that are complex and costly.

General FORMICA For the government to achieve improved quality control, we must focus our efforts on strong quality assurance programs and enhanced con-

tractor oversight. We must increase our collaborative efforts with quality assurance specialists to ensure that appropriate quality clauses and provisions are included in contracts. Additionally, the government should assess and build its organic capability to effectively measure and validate contractor quality and procure essential technical data for effective contractor oversight.

Ms. CHAPLAIN. Over the years, we have identified practices related to technology transition, quality assurance, and other acquisition program management approaches that could benefit space programs. Approaches that could improve the quality of space systems acquisitions include:

- Improving quality systems engineering.
- Holding suppliers accountable to deliver high-quality parts for their products through such activities as regular supplier audits and performance evaluations of quality and delivery.
- Providing effective oversight during the development process.
- Providing an adequate workforce capacity for the front-end acquisition planning activities.
- Capturing manufacturing knowledge in a timely manner.

DOD has developed policies that address the need for adopting commercial quality standards, using good systems engineering practices, and overseeing supplier quality. However, DOD still has difficulty acquiring high-quality weapon systems in a cost-efficient and timely manner. While many problems are caused by poor prime contractor practices related to systems engineering, manufacturing, and supplier quality, an underlying cause lies in the fact that DOD typically assumes most of the financial risk associated with development of complex systems. Moreover, risks associated with this situation are exacerbated because DOD generally enters into development contracts without demonstrated knowledge or firm assurance that requirements are achievable, which too often result in inefficient programs and quality problems.

34. Senator SESSIONS. Ms. Chaplain, I understand that GAO has conducted comprehensive quality review on contractor quality. Could you please share some of your findings and recommendations?

Ms. CHAPLAIN. We were asked by the Committee on Oversight and Government Reform, Subcommittee on National Security, Homeland Defense and Foreign Operations, to assess: (1) the extent to which parts quality problems are affecting DOD and NASA space and missile defense programs; (2) the causes behind these problems; and (3) initiatives to prevent, detect, and mitigate parts quality problems. We reviewed 21 space and missile programs at DOD and NASA that were, as of October 2009, in development, projected to be high cost, and had demonstrated through a critical design review that the maturity of the design was appropriate to support proceeding with full scale fabrication, assembly, integration, and test. Each program provided a list of the top 5 to 10 parts, materials, or processes problems, as defined by that program, affecting that program's cost, schedule, or performance. In addition, they provided an explanation of the root cause and contributing factors that may have led to each problem reported. Through our discussions with agency officials, we were able to obtain information on working groups and initiatives to prevent, detect, and mitigate parts quality problems. At this time, we are unable to discuss our specific findings and recommendations given that the report is in draft and not final. We expected to issue the report in mid-June 2011, at which time we will provide you with a copy.

[Whereupon, at 3:13 p.m., the subcommittee adjourned.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 2012 AND THE FUTURE YEARS DEFENSE PROGRAM

FRIDAY, JUNE 3, 2011

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC FORCES,
COMMITTEE ON ARMED SERVICES,
Bellevue, NE

U.S. STRATEGIC COMMAND

The subcommittee met, pursuant to notice, at 11:33 a.m. in Bellevue Public Schools/Offutt Air Force Base, Welcome Center, 1600 Highway 370, Bellevue, NE, Senator E. Benjamin Nelson (chairman of the subcommittee) presiding.

Committee member present: Senator Nelson.

Majority staff member present: Madelyn R. Creedon, counsel.

Staff assistant present: Hannah I. Lloyd.

Committee members' assistants present: Ann Premer, assistant to Senator Nelson; and Chad Kreikemeier, assistant to Senator Shaheen.

OPENING STATEMENT OF SENATOR E. BENJAMIN NELSON, CHAIRMAN

Senator NELSON. The Senate Armed Services Subcommittee on Strategic Forces will come to order at this time.

General Kehler, welcome. It is a pleasure to be with you here in Bellevue today, just up the road from Offutt Air Force Base, the historic home of the Strategic Air Command (SAC) and today the home of the U.S. Strategic Command (STRATCOM) and the Fighting 55th.

I also want to acknowledge and welcome two retired military leaders, Lieutenant General Bob Hinson and Vice Admiral Bob Bell, who are close advisors to me and continue to serve this community and the Nation. You may know that Vice Admiral Bell retired after 37 years in the Navy and then was President and CEO of the Greater Omaha Chamber of Commerce from 1988 until 2001. Lieutenant General Hinson, prior to his retirement, as did Admiral Bell, served as Vice Commander of the Air Force Space Command and also served as Deputy Commander of STRATCOM.

In 2001 they, along with other leaders in the community, established the Military Support Coalition to champion Offutt Air Force Base, the Fighting 55th, and STRATCOM. For many years before

that, however, they worked to improve and support Offutt. We are certainly grateful that the military service brought both of these officers to Omaha and the community kept them.

The command has a proud history, dating back to its Cold War roots. Since the creation of STRATCOM in 1992, the reach and breadth of the command has continued to grow, particularly following the merger of STRATCOM with U.S. Space Command (SPACECOM) in 2002.

Today STRATCOM is truly a global command. Today its missions include nuclear deterrence, protecting space, thwarting cyber attacks, global strike, combating weapons of mass destruction (WMD), overseeing missile defenses, providing real-time battlefield intelligence, and more. It is probably safe to say that STRATCOM plays one of the most important but perhaps not one of the best known roles in America's national security.

General Kehler, this is your second appearance before the Senate Armed Services Subcommittee on Strategic Forces, but your first opportunity to discuss the full scope of the command and its activities. Although you assumed your responsibilities of this command just a little over 4 months ago, you are not new to these issues and most of your career has been involved with strategic and space systems. You are not new to the command, having previously served as Deputy Commander. Maybe I should say welcome back and welcome home.

But before we begin today, I would also like to recognize the men and women who serve around the world as members of the military services in support of STRATCOM and their families as they support and enable their loved ones to carry out the wide range of important global missions.

The global strike responsibilities have been repeatedly demonstrated in Afghanistan and Iraq. The B–2, the B–52, and the B–1 bombers have all rotated through Iraq or Afghanistan, providing large amounts of ordnance where and when needed. The B–1 has been able to do double duty by providing both ordnance and intelligence.

With the stand-up of the new U.S. Cyber Command, which is part of STRATCOM, there is now a military force to protect and defend military cyber assets and to respond to a cyber attack on the United States when and if necessary. This is a significant challenge. The Department of Defense (DOD) is targeted for thousands of cyber attacks per month. Some estimates range as high as 5,000 attacks per month.

STRATCOM also manages the unmanned aircraft such as Global Hawks, Reapers, and Predators that help the forces in Afghanistan gather intelligence and see over the next hill or mountain. These unmanned aircraft stay in the air for hours and constantly provide eyes in the sky and the fire power necessary to track and, if needed, attack Taliban and others who are attacking U.S. and NATO forces.

STRATCOM is also responsible for implementing the New Strategic Arms Reduction Treaty (START) with Russia, the New START treaty, which the Senate ratified this past December. This new treaty will reduce the number of deployed strategic nuclear weapons and non-deployed nuclear delivery systems that each

country has. We look forward to hearing your thoughts on implementing this important new treaty.

The U.S. military remains a superior military force due in large part to the advantages and capabilities that the military and other national security space systems provide. This advantage is not a secret, and others are constantly trying to reduce that advantage. STRATCOM is responsible for protecting those satellites and finding whoever it is that is trying to interfere with those satellites.

Space is also full of space debris, junk that moves around in space and that can damage our space satellites. STRATCOM is responsible for keeping track of these objects and providing advanced warning so the junk does not collide with the satellites. In 2009, unfortunately a dead Russian satellite collided with a U.S. commercial communications satellite. The two satellites broke apart from the impact and, unfortunately, created even more space debris. STRATCOM also provides warning information to the National Aeronautics and Space Administration (NASA) to protect the astronauts on the Space Station from space debris. Even the Space Station has had to change its location on several occasions to avoid that space debris.

The most important role of the STRATCOM is to maintain a safe, secure, and reliable nuclear deterrent. Maintaining the nuclear deterrent is an everyday event at STRATCOM.

There is also another piece to deterrence for which STRATCOM is also responsible, and that is preventing states and non-state actors from acquiring nuclear weapons, materials, and technologies. This equally important mission is one that is often not well understood by the public or even Congress for that matter, but one that is growing.

Finally, STRATCOM is the responsible command for ensuring that missile defenses are militarily effective. As missile capabilities of countries such as Iran and North Korea grow, the threat to deployed U.S. forces and allies in these regions also grows. The United States has begun, in cooperation with NATO, a missile defense program that will protect our troops and our allies from existing and anticipated regional missile threats, including those from Iran.

So it is a pleasure for me to be here and to welcome all of you to be able to listen to and discuss these issues and all of the work of STRATCOM. General Kehler, your prepared remarks and statement will be included for the record.

Before your opening remarks, I just wanted to thank Hannah Lloyd, our subcommittee staff assistant, and your staff, General Kehler, for all their hard work organizing the hearing today. We do not get the chance to do many field hearings, as they require a little extra preparation being outside of Washington, but I do honestly believe they are important as part of our transparent government and the opportunities that we have to explain to the American public what, in fact, STRATCOM in this case does for our national defense.

General Kehler, I welcome your opening remarks.

STATEMENT OF GEN. C. ROBERT KEHLER, USAF, COMMANDER, U.S. STRATEGIC COMMAND

General KEHLER. Good morning, Mr. Chairman, and thank you on behalf of STRATCOM and the Offutt Air Force Base community. We appreciate this opportunity to appear before the subcommittee again and discuss STRATCOM's missions, responsibilities, and requirements.

On a personal note, Marge and I are very happy to be back in Omaha and Bellevue and part of the Offutt Team again. As you say, we get tremendous support from the local communities here, and I will say a word about that in just another minute.

There is a reason for that and that reason is that the Bellevue and Omaha and Offutt communities share more than 143 years together, beginning with the establishment of what was called Sherman Barracks back in 1868 which later became Fort Omaha and continued with the building of Fort Crook in 1894. Of course, I live in a set of quarters that were completed in 1896. It has been occupied by, I think at last count, 62 leaders that have been assigned here throughout those intervening years. Those quarters have been continuously occupied for all that time.

Of course, Fort Crook added Offutt Field to its purview in 1924 which eventually became Offutt Air Force Base.

Other important milestones include—we, of course, had heavy bomber production for World War II which began in the 1939–1940 timeframe; SAC headquarters, which was established here in 1948; the 55th Strategic Reconnaissance Wing, which was established here in 1966, which became the present day 55th Wing in 1991; the stand-down of SAC and establishment of STRATCOM as a joint command initially in 1992; transition of Global Weather Central into the Air Force Weather Agency in 1997; and of course, the new STRATCOM after merging with SPACECOM in 2002.

I would like to take just a minute to introduce some of STRATCOM's Team Offutt partners whose leaders are with us today. Brigadier General Don Bacon is here. He is the commander of our host unit, the 55th Wing. He took command there in March and leads the second largest wing in the United States Air Force. As I said, the Fighting 55th is our host wing. It operates 48 aircraft from locations around the world. They conduct essential reconnaissance, command and control, treaty verification, presidential support, and airlift missions.

Last March, Don's command passed 7,500 consecutive days deployed in support of U.S. Central Command (CENTCOM) operations. That is a tremendous milestone. They did all of this while providing great host unit support for all of Team Offutt's people, our families, and the retirees that make Omaha home.

Colonel Bob Russell is also with us this morning. He commands the Air Force Weather Agency. That includes 1,400 Active Duty, Reserve, civilian, and contract people that are at locations around the world. Through its groups in observatories, the agency provides global weather products and services, including space weather support to the Air Force, Army, Special Operations, Intelligence Community, and other DOD activities. Notably he claims no credit for the increased rain that has fallen in Nebraska that are causing some worries as we are thinking about the potential for flooding,

and our sympathies are with those that are having to deal with those problems right now.

Of course, our three organizations are all successful and these two commanders would say the same thing that I say about this. We are successful because of the extraordinary men and women we are privileged to lead.

So I would like to recognize four of STRATCOM's enlisted members who represent the best of America's soldiers, sailors, airmen, and marines. From the U.S. Army, Sergeant Ralph Pohlman who was the 2010 STRATCOM Soldier of the Year; from the U.S. Navy, Petty Officer 2nd Class, Erica Bushell, the STRATCOM 2010 Junior Sailor of the Year; Tech Sergeant Alicia Maharaj, the STRATCOM Mid-Tier Enlisted Person of the Year; and from the U.S. Marine Corps, Sergeant Kelly Nielson, STRATCOM's Joint Functional Component Command for Global Strike Marine of the Year.

Senator NELSON. Excuse me. Let us have them stand and let us give them a round of applause.

General KEHLER. Yes, please. [Applause.]

So together, Team Offutt's 35,000 Active Duty warriors, civilians, reservists, contractors, dependents, and retirees share deep bonds with Omaha, Bellevue, and the communities throughout Eastern Nebraska and Western Iowa. As I said, for well over 140 years, our heartland neighbors have opened their arms to welcome our warriors, our families, and our children, which is an interesting side note to where this hearing is located today, one of the unique facilities in my experience in 36 years of military service now where a community has actually dedicated its educational institutions to the support of our military children and how welcome that is as our people struggle with these often moves and the conflict that that shows. I think that says something about Bellevue and the great support that we get from the community here.

In addition, community support and care for our wounded warriors has always been important, and today it has a new and greater sense of emphasis and is an important resource for commanders at every level. On behalf of Team Offutt, and especially to anyone who ever hosted a young service member in your home on a holiday, mowed the lawn of a deployed service member, cared for our wounded warriors, reached out to a new family on the block, or just visited with a deployed member's spouse, I want to say we owe you a very deep and very heartfelt thanks. This bond that we have with this community—as I say, the roots are deep and they go back a very long time.

In this challenging era of protracted conflict, constant change, and enormous complexity, the demands on our servicemembers and their families are great. You may never know how much your many acts of kindness means to those of us who are blessed to receive them, but we are very grateful.

Indeed, today's Armed Forces face a significantly different operating environment than in the past. This is a modern operating environment that is characterized by extraordinary technological advances, rapid changes in the number and type of actors, and hybrid combinations of strategies, tactics, and weapons. We operate in a complex, dynamic, and uncertain environment that demands fo-

cused effort, flexible approaches, and innovative responses. We must think strategically, plan with flexibility, assess comprehensively, and share information in unprecedented ways.

STRATCOM's mission is to detect, deter, and prevent attacks against the United States and our allies and to join with the other combatant commands to defend the Nation should deterrence fail. At subordinate commands, task forces, and bases around the globe, more than 54,000 Active Duty, Reserve, National Guard, and civilian members of our team execute this mission every day.

STRATCOM's mission priorities and responsibilities are complex and far-reaching, and we have five priorities that guide our work.

First, we are to deter nuclear attack with a safe, secure, and effective deterrent force. Our men and women operate the Nation's strategic deterrent forces 24 hours a day, 365 days a year. They also produce the Nation's nuclear employment plans that provide the President with credible response options to deter attack and achieve national security objectives should deterrence fail. Today we are working closely with the Office of the Secretary of Defense, the Joint Staff, and the Services, as you said, Mr. Chairman, to implement both the Nuclear Posture Review (NPR) and the New START treaty. In particular, we are working to implement the treaty's provisions safely, securely, efficiently with the right resources and the right timeline and with the right force structure.

The administration's 10-year plan for investment in our nuclear capabilities, as reflected in the President's budget, is absolutely essential. As affirmed by the 2010 NPR, we must sustain and modernize the nuclear weapons complex, the triad of nuclear forces, our human capital, and key supporting command/control/communications and ISR capabilities. Mr. Chairman, we appreciate Congress' strong support in fiscal year 2011 and we urge full funding again as you consider the fiscal year 2012 President's budget proposal.

Our second priority is to partner with other combatant commands to win today's fight. Ongoing operations demand our full commitment, and in partnership with other combatant commands, we are working to improve plans, procedures, and capabilities to address regional problems, including the development, proliferation, and delivery of WMD and to bring unity of effort, especially where problems and capabilities requirements cross geographic boundaries.

Our third priority is to respond to new challenges in space. As you pointed out, sir, space is increasingly contested, congested, and competitive, and its importance goes far beyond national security. We must ensure uninterrupted access to space and space-based capabilities, improve our awareness of objects and activities in space, and enhance the protection and resilience of our most important systems.

Our fourth priority is to build cyberspace capability and capacity. In cyberspace, our greatest challenge is to improve our ability to operate and defend DOD's networks at cyber speed, to make sure our vital activities can continue even in the face of attempts to deny or disrupt, something that happens thousands of times every day.

With our subunified command, U.S. Cyber Command, we are working hard to improve organizations and relationships, enhance

network situational awareness and protection, increase technical capacity, and develop the human capital we need as we look to the future.

Finally, fifth, we must prepare for uncertainty. Today's adversaries and tomorrow's potential challengers closely watch our actions, our plans, and our capabilities to understand our values, our operations, and our vulnerabilities. These actors are not static, and combined with environmental, economic, and other factors, these potential adversaries could present surprising and asymmetric conventional, digital, or WMD challenges against which we must constantly be vigilant.

Tying together this range of truly global responsibilities and associated capabilities must be a reliable and assured national command, control, and communication capability from the President to the nuclear forces and across the range of military capabilities. Our current systems require investment to ensure reliability and to address looming capability gaps. A new STRATCOM and control complex and nuclear command and control node at Offutt Air Force Base is the center of our nuclear C3 plans for the future. STRATCOM operates a unique national command and control capability, and today's complex command center and IT systems lack the capability and capacity to support our missions in the long term.

Sir, again, we appreciate your support and the subcommittee's support for the President's request for funding in fiscal year 2012 for this new nuclear and national command and control node.

So in conclusion, sir, the Active Duty, Reserve, National Guard, and civilian members of STRATCOM's team perform their difficult mission with remarkable skill and dedication. I am proud to be associated with them and look forward to working with you and the subcommittee as we address these important national security issues.

Again, we appreciate the opportunity to appear in front of the subcommittee. We especially appreciate the opportunity to do so right outside our gate in Bellevue. With that, sir, I look forward to your questions.

[The prepared statement of General Kehler follows:]

PREPARED STATEMENT BY GEN. C. ROBERT KEHLER, USAF

Chairman Nelson, Senator Sessions, and members of the subcommittee, thank you for the opportunity to present my views on U.S. Strategic Command's (STRATCOM) missions and priorities. I am especially pleased to have this hearing here in Nebraska, just down the road from STRATCOM's headquarters and Offutt Air Force Base. We have a great team here and throughout our distributed command. Today is an important opportunity to showcase STRATCOM's Active Duty, Reserve, National Guard, and civilian members, who are standing watch this very minute at locations across the country and around the globe. They truly exemplify the best of today's joint force. I look forward to discussing the command's missions with you today, especially our role in the Nation's nuclear command, control, and communications (NC3) architecture and essential NC3 capability requirements.

America's strategic forces proudly continue their longstanding role as the foundation of our national security posture. The President of the United States has assigned STRATCOM the responsibility to detect, deter, prevent, and defeat attacks against the United States, its territories, possessions and bases, and to employ appropriate force to defend the Nation should deterrence fail. The Command's specific mission responsibilities include planning, synchronizing, advocating, and employing capabilities to meet the Nation's strategic deterrence, space operations, cyberspace operations, information operations (IO), global strike, missile defense, intelligence,

surveillance, reconnaissance (ISR), and combating weapons of mass destruction (CWMD) objectives. We conduct these activities in close coordination with other combatant commands around the world. Today, I would like to describe the strategic context in which we operate and STRATCOM's priorities for addressing our many challenges.

STRATEGIC CONTEXT

The national security landscape continues to be marked by protracted conflict, constant change, and enormous complexity. While war remains a difficult struggle between human beings, today's operating environment is significantly different than those we experienced in the past. The number and type of actors (state, non-state, terrorist, criminal) are rapidly changing, and the distinction between combatants and non-combatants is less clear. Friend and foe alike can span global distances in seconds through space and cyberspace, and technological advances allow adversaries to cross traditional geographic and military boundaries with ease. Adversaries seek advantages by using asymmetric means to find and exploit our vulnerabilities and to defeat our advanced capabilities in air, sea, space, and cyberspace. At the same time, these adversaries wield hybrid combinations of capabilities, strategies, and tactics and operate in the shadows to present us with ambiguous indications and situations. Rapid technological evolution and the wide civil availability of formerly advanced military capabilities have also reduced .entry costs,. making available completely new weapons and enabling actors to access capabilities that would not have been available to them in the past without significant investment. Indeed, surprise may be our deadliest foe, because it can make our plans ineffective, our training irrelevant, and, therefore, our organizations vulnerable.

The need to foster strategic stability and deter strategic conflict, ensure uninterrupted capabilities from and access to space and cyberspace, respond to traditional and non-traditional threats, and deal with surprise in an era of rapid technological advances presents STRATCOM with significant challenges. Of the threats we face, weapons of mass destruction clearly represent the greatest threat to the American people, particularly when pursued or possessed by violent extremists or state proliferators. The potential of nuclear uncertainties in unstable regions adds special significance to this concern.

At the same time, today's fiscal environment will pose additional challenges regarding the means and manner with which we address the difficult global, strategic landscape. Last year, Secretary of Defense Robert Gates challenged us to foster an efficient "culture of saving" throughout the Department of Defense (DOD). The resulting review emphasized our responsibility to maximize both mission effectiveness and taxpayer value. STRATCOM's exhaustive assessment of our missions identified some functions that we could reduce, consolidate with other DOD organizations, or eliminate in favor of higher priority operational requirements. We are now evaluating these initiatives with the DOD leadership and will realign resources as directed at the conclusion of this assessment.

In summary, the challenges are great, the choices are hard, and there is no textbook solution.

PRIORITIES

The 21st century security environment demands fast, comprehensive awareness, strategic thinking, flexible planning, decentralized execution, rapid innovation, and an unprecedented emphasis on sharing information. In this environment, STRATCOM has been uniquely organized and positioned to shape and employ global capabilities to deter, enable, and, when needed, join with the other combatant commands to fight and win the ever changing joint fight.

First and foremost, we must guarantee a safe, secure, effective, and ready nuclear deterrent force. As affirmed by the 2010 Nuclear Posture Review (NPR), sustaining and modernizing the nuclear weapons complex, the triad of nuclear forces, the human capital, and key supporting command/control/communications (C3) and intelligence/surveillance/reconnaissance (ISR) capabilities is essential to retain confidence in the deterrent's long-term credibility, provide tools to combat proliferation, and assure our scientific and innovation edge.

Next, in full partnership with the other combatant commands, we must improve our plans, procedures, and capabilities to address trans-regional problems. Ongoing operations demand our full commitment, and STRATCOM's activities both enable and support joint operations around the world. The Command's work to synchronize and advocate for missile defense, ISR, electronic warfare, and combating WMD plans and capabilities helps bring unity of effort and flexible capabilities to trans-regional operations. Whether providing space-based communications or position,

navigation, and timing (PNT) information, rapidly transmitting data around the world, or ensuring tested, capable missile defenses or other globally significant capabilities are developed, positioned, and optimally managed, STRATCOM is instrumental in winning today's dynamic joint fight.

Finally, we must continue to improve our capabilities and operating concepts in the important civil and national security areas of space and cyberspace. Ensuring uninterrupted access to space and space-based capabilities, improving our awareness of objects and activities in space, integrating their effects with all operational phases, improving space access, protection, and resilience, and expanding our planning and implementation for partnership operations requires that we continue our investment and that we demand acquisition results. For cyberspace, we must enhance network protection and mature our organizations, capabilities, workforce, and partnerships to ensure effective operations.

STRATEGIC DETERRENCE

In today's complex security environment, the concept of strategic deterrence must encompass strategies to deter adversaries and dissuade competitors across the full range of their capabilities. We must consider actors and capabilities in aggregate, not in a vacuum, a need that highlights the importance of a better understanding of adversaries' values, motivators, capabilities, intentions, and decisionmaking processes. Not every potential adversary has or seeks nuclear weapons, and modern deterrence requires broad coordination, tailored strategies, effective capabilities, international cooperation, and focused capabilities like conventional prompt global strike.

Still, STRATCOM's first priority is to deter nuclear attack on the United States, our allies, and our partners. Last year, the Quadrennial Defense Review (QDR), the NPR, and the New Strategic Arms Reduction Treaty (New START) discussions produced an important national consensus that affirmed the necessity of the United States' nuclear deterrent and the funding required to sustain it. The president has pledged that the United States will maintain a safe, secure, and effective nuclear deterrent as long as nuclear weapons exist. STRATCOM is now committed to implementing New START and to advocating for planned investment in the deterrent force. The updated "1251 Report" submitted in February of this year outlines both DOD and Department of Energy nuclear funding requirements through fiscal year 2021. While budget estimates will be refined as major program baselines evolve, these important investments must begin immediately. I very much appreciate Congress' strong fiscal year 2011 support and urge you to fully fund the President's request in fiscal year 2012.

Nuclear Enterprise

The fiscal year 2011 and 2012 budget requests reverse several years of downward trend in nuclear enterprise funding. These budgets provide investments in the facilities, equipment, and personnel dedicated to sustaining and managing the Nation's nuclear weapons, as well as to dismantling weapons no longer needed. To emphasize the importance of this investment and to better understand the conditions, urgent needs, and impending challenges across the complex. I made visiting each lab and production facility a high priority upon taking command, and to date I have visited all three nuclear weapons laboratories and most other related facilities—with plans to complete these visits soon.

The men and women of America's nuclear weapons complex perform uniquely difficult, highly technical, and demanding work. As our stockpile ages well beyond each weapon's originally designed lifespan, robust stockpile surveillance and assessment programs will enable strategic deterrence and stability at New START force levels. Weapon safety, reliability, and performance may change in ways we cannot fully predict, and surveillance activities permit confidence and continued stockpile certification without nuclear testing. Dedicated surveillance and life extension studies constitute the best means of informing the President and Congress of our nuclear weapons' health, status, and requirements. The NPR's case-by-case approach to studying and selecting from the full range of life extension options (refurbishment, reuse, and, if needed, replacement) ensures the best future for our stockpile.

Today, a narrow window is available to synchronize weapon sustainment efforts for the W76–1 and B61 (full scope) life extension activities—cost-effectively introducing improved safety and security features, avoiding a second B61 nuclear refurbishment in the 2020s, and potentially reducing the stockpile by consolidating four legacy B61 variants into a single weapon. In addition, a Nuclear Weapons Council study of W78 Intercontinental Ballistic Missile (ICBM) and W88 submarine-launched ballistic missile life extension program options will examine opportunities to use modular fuze components and develop a possible common warhead, potentially reducing costs and supporting long-term capability sustainment. These and fu-

ture actions that evaluate ways to reduce warhead numbers and types through stockpile commonality and flexibility offer the opportunity to continue accomplishing our strategic deterrence mission while also achieving the goal of a smaller, more efficient stockpile.

Strategic Delivery Vehicles

The NPR also affirmed the continuing need for the nuclear triad, which provides the President with multiple options for a variety of scenarios. The value of the triad lies in its flexibility and responsiveness to the changing world environment and in its ability to hedge against technical failure, geopolitical change, or a breakthrough in another nation's capabilities. America's strategic forces require continued investment to ensure their future capability, and STRATCOM is actively engaged with our Service partners to define and advocate for necessary nuclear force modernization and recapitalization programs.

Intercontinental Ballistic Missiles

The widely dispersed and responsive Minuteman III ICBM force provides high readiness, low operating costs, and sovereign basing with multiple aim points that complicate adversary targeting. The Air Force is successfully concluding decade-long efforts to enhance safety and security and to sustain the Minuteman force through 2020. The Air Force is also evaluating requirements to sustain the force through 2030. STRATCOM supports these programs and is working with the Air Force on a Capabilities Based Assessment and pre-analysis of alternatives activities that begin to define options for a follow-on land-based strategic deterrent beyond 2030.

Submarine-Launched Ballistic Missiles

Ohio-class SSBNs provide an assured and highly survivable response capability, and the highly accurate Trident II D5 strategic weapon system continues to exceed the demanding operational reliability standards established almost 30 years ago. By the time they begin to retire in 2027, the *Ohio*-class SSBNs will have served for more than 40 years. The Navy completed an *Ohio*-class follow on platform AoA and, with STRATCOM, continues to refine specific replacement requirements. STRATCOM fully supports Navy efforts to maintain the current fleet, fund the necessary research and development for its replacement, and sustain the Trident II D5 ballistic missile and associated infrastructure to satisfy future deterrent requirements. For example, current infrastructure at Naval Base Kitsap-Bangor, WA lacks sufficient Explosive Handling Wharf (EHW) capacity to meet growing missile handling requirements. A second Pacific EHW wharf at Naval Base Kitsap-Bangor, WA, is essential to long-term SSBN readiness.

Bombers

America's B–2s and B–52s ensure that the President has visible and flexible conventional and nuclear global strike and deterrence options. Affirming their critical deterrent role, the nuclear-capable bomber force transitioned to STRATCOM's day-to-day operational control in 2010. STRATCOM now has a far stronger voice in balancing this unique, dual-capable nuclear and conventional bomber force's day-to-day readiness, training, and operational employment. While the Air Force continues to sustain mission-critical systems, it will also soon begin developing a new long-range, dual-capable penetrating bomber. Coupled with the development of a new bomber, two additional capabilities will ensure the viability of the air-breathing leg of the Triad for decades to come. Air Force investments will sustain the Air Launched Cruise Missile through 2030 (or until a suitable replacement is fielded), ensuring standoff capability for the long term. Further, the bomber force must be supported by a fleet of new aerial refueling tankers to extend their range and assure the bombers' strategic and extended deterrence roles. STRATCOM supports Air Force progress toward ensuring the long-term health of the airborne component of our strategic capability.

Nuclear Command, Control, and Communications

A reliable, assured C3 capability from the President to the nuclear forces is fundamental to an effective strategic deterrent. National leaders, commanders, ISR assets, and strategic forces must share assured linkages to confidently understand and effectively address nuclear mission demands. Current systems require investments to ensure reliability and address looming capability gaps in our National Leadership Command Capability.

A new Strategic Command and Control Complex and Nuclear C3 node at Offutt Air Force Base, NE, is at the center of our nuclear C3 plans. The fiscal year 2012 budget seeks a first increment of $150 million to begin replacing the aging and fragile Curtis E. LeMay building and colocated facilities. Today's building, command

center, and computer systems took shape long before the IT revolution and now lack the capacity to support current mission demands. The buildings' systems strain to support numerous computer and communication systems, and the spaces occasionally experience serious heating and cooling problems, electrical failures, and other outages. For example, in December 2010 and January 2011, two water pipe ruptures caused significant system outages and dislocated staff for several days, although the Command remained capable of performing its missions due to extraordinary workarounds and the remarkable efforts of the dedicated staff and a small army of outside emergency help.

Prior to defining the current requirement, STRATCOM—in consultation with the Army Corps of Engineers and the Air Force—evaluated sustaining the status quo, renovating the existing facility, or engaging in new construction. The evaluation concluded that new construction offered the most operationally efficient solution to support STRATCOM's missions, operations, and nuclear C3 needs. The new facility will ensure an EMP-protected, flexible, sustainable, reliable, and collaborative environment with an infrastructure that meets the security challenges of today and tomorrow.

Conventional Prompt Global Strike

A limited, credible, conventional Prompt Global Strike (PGS) capability would provide the President with an important deterrent option in some strategic scenarios. Today, we still lack the ability to rapidly deliver conventional effects against fleeting or geographically isolated targets, allowing a potential adversary to establish a sanctuary using mobility and strategic depth. Research, development, test, and evaluation projects continue making progress, and I ask you to continue supporting these PGS efforts.

International Engagement

Deterring and dissuading nuclear threats in today's national security environment also requires careful attention to international relationships. While the specter of global nuclear war may be more remote than decades ago, the possibility for miscalculation between nuclear-armed states remains a perilous threat to global security. As noted in the NPR, "Enduring alliances and broad-based political relationships are the foundation of strategic stability and security." Indeed, many nuclear-armed states are important partners in combating proliferation. New START lowers the maximum number of U.S. and Russian strategic offensive arms, restores an important, confidence-building verification regime, and provides opportunities to continue military-to-military engagement. China's willingness to consider and study Secretary Gates' proposal for a strategic security dialogue represents an important avenue for growth between our two militaries in this area as well. STRATCOM will continue to support DOD, Department of State, and geographic combatant command activities to develop stable and cooperative relations with other responsible nuclear powers and will be prepared to provide advice on other arms control measures that could encompass a greater range of weapons.

SPACE

Throughout the 20th century, the United States and other countries developed and exploited the space domain's extraordinary potential, including changing how we navigate, communicate, and understand our world. However, the domain is increasingly congested, contested, and competitive. Guaranteeing mission assurance through adequate Space Situational Awareness (SSA), resilience, and critical-asset protection is essential. The new National Space Policy, signed by the President, and the National Security Space Strategy (NSSS), co-signed by the Secretary of Defense and Director of National Intelligence, emphasize the need to continue developing resilient capabilities which will improve our ability to satisfy combatant commanders' requirements for uninterrupted ISR, expanded military satellite communications, and PNT support. Implementing the NSSS will position the national security space enterprise to shape and strengthen the space domain's safety, stability, and security; to maintain and enhance U.S. advantages in space; to energize the U.S. industrial base by engaging a broad range of partners; to prevent and deter aggression; and to improve sustainability, acquisition, and flexibility of U.S. space capabilities.

Situational Awareness

SSA is central to mission assurance and increasingly important. As part of its SSA mission, STRATCOM now tracks more than 22,000 orbiting objects. Approximately 1,100 of these objects are active satellites, but the remaining debris litter a variety of orbits and threatens both critical systems and human spaceflight. While space surveillance is improving, we do not yet have robust, assured, and real-time

situational awareness of the orbital domain. Current and future investments should expand data integration, sharing, and exploitation; improve object detection, identification, and tracking; and advance our ability to characterize potential collisions (conjunctions). Notably, the proposed Space Fence promises to expand detection capacity more than tenfold from just two or three locations outside the continental United States and to construct a more comprehensive orbital picture. Increasing the number of objects tracked will be largely useless, however, without corresponding improvements in data integration and exploitation technologies. As part of its SSA mission, the Joint Space Operations Center (JSpOC) must also be prepared to identify and attribute purposeful space system interference and provide timely recommendations to address the interference. Without space situational awareness of the orbital domain, link segment, and supporting ground infrastructure, any plans for resilience, mission assurance, augmentation, and reconstitution will have a weak underpinning. STRATCOM fully supports funding for both the JSpOC Mission System (JMS) and planning and design work for a modern JSpOC facility that will facilitate a generational leap from static displays to automated, real-time visual conjunction analyses—improving our ability to protect critical space-based assets and maintain our free access to and use of space. In addition, technology will soon allow us to link multiple sensors together in a single network that will meet the needs of many users.

Cooperation

As a global domain, space and space-based capabilities operate irrespective of geographic or military boundaries. As more nations join the space-faring ranks each year and the number of objects in earth orbit grows, the need to establish norms of behavior and to improve the cooperation and collaboration among responsible space users grows as well. Our objective is to sustain a safe, stable, and secure space domain while maintaining the national security advantages space systems provide. U.S. efforts to share SSA data represent an important step toward greater international space cooperation, which should eventually help to integrate sensors and data from allies and partners worldwide and ultimately move towards a combined space operations center.

Today, the STRATCOM SSA sharing community includes more than 41,000 users in 141 countries. Our efforts promote the safe and responsible use of space by providing satellite operators with highly accurate predictions of close approaches between space objects for every satellite operator. Since the Secretary of Defense delegated his authority to enter into agreements with commercial entities to the STRATCOM Commander last September, we have concluded 23 agreements and are processing others. Each partner and each agreement signifies an operational relationship that can yield important exchanges, perhaps someday leading to a broad, international partnership for space situational awareness. STRATCOM fully supports expanded planning and implementation for space partnership operations among allies, coalition partners, and commercial interests and will work with our partners in the DOD and elsewhere to help review proposals to establish normalized behavior.

Space-Based Capabilities

Enabling better situational awareness will improve the overall U.S. space posture; however, long-term, uninterrupted capability from space requires equal dedication to protection, resilience, augmentation, and reconstitution of assets in space, supported by timely design and development, cost-effective acquisition, and high-confidence space launch. Today's operating forces rely on space capabilities throughout the kill chain and beyond. Putting already stressed space capabilities that allow the joint force to navigate, communicate, see the battlefield, and strike under all conditions in the kill chain places those same valuable capabilities on any potential adversary's target list. STRATCOM fully supports DOD efforts to improve resilience and increase the protection of key space assets.

Launch

Reliable space capabilities also require an assured ride to orbit. Evolved Expendable Launch Vehicles (EELVs) are the DOD's primary launch vehicles and the sole U.S. vehicles for much of the national security manifest. STRATCOM supports further Air Force investments in this and other programs that will assure our access to space. Additionally, improvements in manifest and scheduling processes and investments designed to sustain and ensure national launch facilities' availability for future demand will maximize synergies between launch management and national priorities.

Industrial Base Concerns

Beneath our national security space requirements lies the need for a stable, responsive, and innovative national industrial base. Since the space age began, we have rarely been so reliant on so few industrial suppliers. Many struggle to remain competitive as demand for highly specialized components and existing export controls reduce their customers to a niche government market. Careful interagency planning that more tightly defines and oversees requirements, supported by stable budgets and production rates will help sustain a national industrial base essential to commercial users, military space, and the strategic deterrent. The retirement of the Space Shuttle and other changes at NASA also injected significant concern into the solid rocket motor industrial base—an industry we cannot afford to lose. Substantial weakening of this capability would impede current strategic system sustainment and follow-on development. While industry adjustments are inevitable, DOD, in consultation with NASA and other agencies, is working to sustain the solid rocket motor industrial base to ensure we retain right-sized, cost-efficient, and viable design, development, and production capabilities. STRATCOM supports these important DOD efforts to improve program stability, increase the quantity and quality of the acquisition workforce, strengthen clarity and articulation in the requirements process, and stimulate scientific and technological advancements.

CYBERSPACE

Last fall in Foreign Affairs, Deputy Secretary of Defense William Lynn noted that, "Every day, U.S. military and civilian networks are probed thousands of times and scanned millions of times." Like space, cyberspace capabilities have rapidly become critical but also increasingly vulnerable. Cyberspace's pervasive presence, high importance, difficulty of attribution, and low cost of entry highlight some of our challenges. Combined with a growing, global reliance on cyberspace and its hosted capabilities, this constant evolution challenges mission assurance efforts—particularly as the threat moves from exploitation to disruption. Ensuring reliable, sustainable networks, freedom of access, and freedom of maneuver is not just a DOD problem. This is a national security problem. Assuring access demands sustained, resilient, and flexible approaches to maturing our defense capabilities, our capacity, and our cooperative relationships within and beyond the U.S. Government.

Capabilities

The most important asset any commander can have is robust, up-to-date situational awareness. Cyberspace is dynamic, and specific threats require specific countermeasures. The Maginot Line failed because it was static and the defense failed to anticipate and address technological and tactical changes. .After the fact. detection and attribution don't work in cyberspace today either. The offense always has a strong advantage, overwhelming, subverting, or defeating static defenses. Continued advances in system and organization teamwork, coupled with the development and deployment of information-based capabilities and intelligence-driven sensors that .see. intrusions and can respond at equivalent speed is essential. Driven by strong, capable organizations, dynamic, agile, and informed capabilities that comprehend the network and mitigate threats at the boundary will significantly strengthen defense of DOD networks.

In response to the growing threat, last year the DOD established U.S. Cyber Command (CYBERCOM) at Fort Meade, MD as a subunified command to STRATCOM. STRATCOM delegated responsibilities to CYBERCOM to coordinate, plan, synchronize, and execute cyberspace operations in order to better defend DOD networks and to support other combatant commanders. We must accelerate the acquisition of comprehensive, shared cyber awareness tools to expand opportunities to secure critical information, reduce points of vulnerability, and develop responses to ensure warfighter access to essential information systems.

Capacity. Today, operators at CYBERCOM and its subordinate Service components work to defend against and attribute numerous information network intrusion attempts. The cyber workforce is growing, but our organizations and capabilities must also grow to keep pace with ongoing operations. STRATCOM is working with CYBERCOM to improve the cyber awareness of every DOD member with access to an information system, strengthen organizations, resolve roles/responsibilities, expand partnerships, build technological and human capacity for full-spectrum cyberspace operations, and integrate cyber capabilities into every commander's plans and operations. Recruiting adequately trained and equipped cyber warriors is challenging, but fortunately young Americans grow up learning and adapting to new technological platforms from a young age. Service cyber career paths are still being developed, and these critical, technical skills need both time to develop and sus-

tained investment to prevent their atrophy. Sustained force development emphasis and investment is essential. The U.S. is also home to the world's premier educational and commercial information technology entities. We must continue to capitalize on this capacity and partner with these organizations on our requirements and to spur domestic math and science interest. Doing so will help develop, expand, and sustain a base of cyber expertise and adapt DOD personnel processes to attract, develop, and retain the cyber professionals necessary to protect critical DOD infrastructure and preserve U.S. freedom of action in cyberspace.

Cooperation

Cyber defense must include a wide range of partners. After all, this is truly a national security issue, making interagency and allied partner engagement and information sharing essential to a robust defense. Military operations depend on the broader U.S. information technology infrastructure, and defending military networks will net fewer benefits if the wider civilian infrastructure remains at much greater risk. The Department of Homeland Security (DHS) is ultimately responsible for coordinating the protection of the ".gov" and domestic ".com" domains, but DOD has much to offer in terms of intelligence and technical support. The DOD–DHS Memorandum of Understanding signed last fall lays important groundwork for enhanced cooperation, mutual support, and synchronized operations.

WINNING TODAY'S FIGHT

In strategic deterrence, space, and cyberspace, STRATCOM both operates forces and supports the full range of military operations. The broad scope of our responsibilities and trans-regional capabilities is clearly woven into the fabric of today's operations. Winning the fight, whether we are either a supported command or are supporting the geographic combatant commands, is something our team strives to do each and every day. However, STRATCOM also has responsibilities to integrate, synchronize, and advocate for other capabilities with trans-regional impact, and we are dedicated to partnering with other combatant commands to improve the warfighting effectiveness of these capabilities.

Information Operations

Consistent with our mission to improve strategic joint capabilities, STRATCOM participated in a 2010 Secretary of Defense directed Strategic Communication (SC) and IO Front-End Assessment, designed to evaluate and recommend improvements for DOD roles, missions, definition, management, and resources for SC and IO. As a result of the assessment, STRATCOM will reorganize the Joint Information Operations Warfare Center (JIOWC) at Lackland AFB, TX. Existing JIOWC resources and missions not specific to electronic warfare will be realigned to the Joint Staff, and STRATCOM will remain the DOD lead for Electronic Warfare (EW).

Electronic warfare

The electromagnetic spectrum spans almost every modern technological convenience. While operational plans normally assume unfettered spectrum access, this assumption is not assured. Changing industry standards, global growth of civilian devices, military bandwidth requirements, and disruptive or destructive adversary electronic warfare capabilities all threaten to pinch or sever the shrinking electromagnetic links between national security platforms and the operating forces that rely on them.

Recognizing future threats, potential limitations, urgent warfighter needs, and the need for unified DOD advocacy, JIOWC completed several Joint Requirements Oversight Council (JROC) tasks to examine capability gaps and solutions for emerging electromagnetic spectrum threats. The National Defense Authorization Act for Fiscal Year 2010 required DOD to develop an EW strategy, submitted to Congress last year. That EW strategy concluded that we must move beyond the traditional understanding of EW by combining it with other kinetic or non-kinetic capabilities to increase U.S. combat effectiveness and achieve electromagnetic spectrum superiority. STRATCOM is planning to establish a Joint Electronic Warfare Center to advocate for and support DOD Joint EW capability requirements, resources, strategy, doctrine, planning, training, and operational support.

Missile Defense

The Ballistic Missile Defense System (BMDS) exists to meet combatant commands' theater defense needs and to provide for the limited defense of the United States. Working with geographic combatant commands and the Missile Defense Agency (MDA), our efforts focus on building tailored, regional missile defense architectures using the concept of a Phased Adaptive Approach (PAA) and on meeting

urgent warfighter capability needs. STRATCOM's work provides a comprehensive assessment of the fielded BMDS's suitability and effectiveness and combines warfighter needs for air, cruise missile, and ballistic missile defense capabilities to inform programmatic actions and guide future R&D investment priorities.

At the 2010 Lisbon Summit, North Atlantic Treaty Organization NATO allies affirmed the PAA for missile defense as a means to address the continued qualitative and quantitative growth of global ballistic missile programs. The Allies also invited the Russian Federation to participate in missile defense cooperation. As a strategy, PAA applies to several geographic combatant commands, and STRATCOM's current challenge is to make sound, analytically-based recommendations to balance limited BMD assets worldwide. The European PAA's four phases of increasing capability are designed to defend against existing and near-term threats posed by short- and medium-range ballistic missiles and to build up defenses against long-range ballistic threats over time as those threats mature. As stated during the New START debate, the U.S. will not agree to any ballistic missile defense limitations or constraints and indeed intends to continue developing and deploying systems consistent with U.S. interests. The U.S. missile defense program is not designed to counter the strategic forces of Russia or China, but rather to address limited ballistic missile threats such as those posed by Iran and North Korea.

As various regional PAAs develop, STRATCOM will continually re-evaluate the standing Global Integrated Missile Defense Concept of Operations and other acquisition, deployment, basing, and employment plans for missile defense capabilities between and across all areas of responsibility. Our analysis will ensure that the joint warfighters' requirements receive deliberate management and readiness structures to ensure timely, flexible deployment, employment and redeployment of tested, understood BMD capabilities during and after crises.

Consistent with the Ballistic Missile Defense Review, new advancements and allied technologies must be made interoperable with existing systems, including required improvements in discrimination capabilities essential to the efficient employment of limited missile defense resources.

Intelligence, Surveillance, and Reconnaissance

Timely, useable situational awareness and intelligence analysis is essential to all military operations. Airborne, submarine, and space-based ISR capabilities all provide key indications and warning information to commanders facing an array of traditional adversaries, nontraditional threats, and challenging intelligence problems. For the past decade, ISR efforts focused primarily on meeting the expanding demand in the U.S. Central Command (CENTCOM) area of responsibility. As overseas contingency operations change, DOD must carefully examine force requirements to ensure we organize, train, and equip a balanced force across the range of requirements, including anti-access environments and New START verification. An objective, multi-domain, capabilities-based architecture that improves the ability to identify requirements across geographic boundaries and the range of potential threats is essential to appropriately balancing risk against necessary programmatic, budgetary, and acquisition decision points.

STRATCOM's ISR efforts achieved significant resource efficiencies and shaped ISR capability decisions through initiatives like the ISR Force Sizing Construct project, the High Altitude Transition study, the Synoptic Operational Area Reconnaissance Study, and the Mobile Nuclear Air Sampling Study. STRATCOM also successfully advocated for a critical CENTCOM ISR capability—designed and executed in approximately 30 months and at a lower cost than traditional acquisition processes. The Services and Intelligence Community must continue to strive for better integration in order to reach greater efficiencies—not only for the collection platforms themselves but also across the still-limited processing, exploitation, and dissemination architecture needed to transform collections into actionable intelligence.

Combating Weapons of Mass Destruction

Another mission area requiring sustained attention is CWMD, since the pursuit of WMD by violent extremists and their proliferation to additional states remains the primary threat to the United States, our allies, and our partners. STRATCOM received the responsibility to synchronize DOD CWMD activities in 2005 and has made discouraging, detecting, deterring, and, if necessary, defeating these threats a priority for theater operations and strategic deterrence. Some actors seek nuclear, biological, or chemical weapons to coerce their neighbors or to deter U.S. intervention in regional conflicts. Others may seek such weapons to use them in terrorist attacks or as weapons of war. Diffuse networks of non-state entities, secretive state sponsors, shell corporations, and terrorist-financed transactions challenge our intelligence organizations to develop comprehensive, accurate, and actionable assess-

ments that enable global CWMD. STRATCOM continues to pursue further national CWMD capability improvements with interagency partners to coordinate CWMD objectives, plans, and activities.

Among current and future CWMD enhancements are technological improvements to detect, analyze, and assess WMD developments. The 2010 QDR affirmed the need to enhance National Technical Nuclear Forensics capabilities which, along with accurate intelligence and other information, support nuclear threat attribution and may thereby deter those considering the diversion, transfer, development, or use of nuclear weapons, improvised nuclear devices, radiological dispersal devices, and other nuclear or radiological threats. In the past year, the STRATCOM Center for CWMD (SCC WMD) embedded Proliferation Security Initiative activities within U.S. Africa Command, CENTCOM, and U.S. Southern Command exercises and supported planning and funding efforts to expand exercise participation and training synchronization across geographic combatant commands. Finally, SCC WMD collaboratively operates the Interagency Combating Weapons of Mass Destruction Database of Responsibilities, Authorities, and Capabilities (INDRAC) System with the Defense Threat Reduction Agency. INDRAC provides a strategic level information reference resource to inform CWMD operations, planning, advocacy, training, and exercises across the government.

In the 2010 QDR, the Secretary of Defense directed DOD to establish a Joint Task Force Elimination Headquarters to "better plan, train, and execute WMD-elimination operations . . . with increased nuclear disablement, exploitation, intelligence, and coordination capabilities." Last December, Secretary Gates tasked STRATCOM to execute this task and stand up a Standing Joint Force Headquarters for Elimination of WMD with "standing exploitation and intelligence cells in order to plan, train for, and execute global WMD elimination operations." STRATCOM is currently analyzing the requirements necessary to implement the Secretary's direction.

CONCLUSION

Great challenges lie ahead of the United States and STRATCOM, but so too do great opportunities. The Command is dedicated to being an effective steward of taxpayer resources while maintaining a strategic force structure ready and able to deter aggression, preserve U.S. freedom of action, and defeat adversaries when necessary. The uncertainty inherent in today's complex, multi-domain security environment requires that we summon our best efforts to develop and deploy the plans, systems, and forces needed to sustain America's deterrent, ensure unfettered access to and through space and cyberspace, and win the dynamic joint fight. I look forward to working with Congress as we pursue these priorities together, and I appreciate your support and counsel in the months and years ahead. Thank you again for the opportunity to be here today, and welcome back to Nebraska and the Bellevue-Offutt community.

Senator NELSON. Thank you very much, General.

The advantage of being the only member here is I get to ask all the questions. I do not have to share the time with anybody else. So there is an advantage. It was not why I thought we ought to do it here, but it is certainly an added benefit.

Thank you for your very thoughtful comments, and I do have a couple of questions.

In your prepared statement, you described the mission of STRATCOM and it includes the responsibility to foster strategic stability and, as you have said, ensure uninterrupted capabilities from and access to space and cyberspace, respond to both traditional and nontraditional threats, and deal with surprise in an era of rapid technological advances as we talked about this morning, a very complex but related set of missions.

Now that you have been in your new responsibilities as commander, what are the three most difficult challenges that you see in being able to fulfill these missions?

General KEHLER. Mr. Chairman, the first challenge that I would continue to highlight is this dramatically different operating environment that we find ourselves in today. I think my colleagues in the other combatant commands would share my assessment of this.

I do not think we have ever seen an operating environment like today's. When we look at the range of activity that we are engaged in around the world today, when we look at the complexity of the national security environment that we find ourselves engaged with today, when we look at the differences for us—for example, when we talk about space and cyberspace, items that we have talked about in military planning for years about distances and time do not mean the same thing when you can span global distances through space and cyberspace in milliseconds.

When we talk about boundaries—and typically we have focused on geographic areas as areas of interest for our military activities—those boundaries are not the same when we talk about space and cyberspace.

When we talk about asymmetric challenges to us—and those come frequently in space and cyberspace. This ambiguity—actors can act in cyberspace and you never know who they are or you do not know for quite some time until you do the forensics and discover who someone was when they were actually doing some criminal activity, for example, in cyberspace.

So the changed operating environment is one of the toughest challenges that we face.

The second one with aging systems, in particular, is to ensure the level of readiness that we need to meet those challenges in this new operating environment. We find that continued investment is required certainly across the nuclear enterprise. We have testified to that before, as you well know. The President's budget contains requests to continue our investment in the existing forces that we have for strategic deterrence, as well as the support and command and control, as well as the weapons complex that underpins all of it.

In addition to that, I am equally concerned about aging weapons systems today. We were very gratified with the selection by the Air Force of a new tanker and the ability to move forward there. We are very gratified that Congress has given us approval to move forward with a replacement to the *Ohio*-class submarine. We have been very encouraged by decisions inside DOD in the proposal now to Congress to go forward with a new bomber platform. In the meantime, we have to make sure that we are sustaining those platforms that are out there to include our space systems, to include the new area that we have for cyberspace.

Finally, the third challenge that I have that I think about every day is preparing for and responding to surprise. Surprise can be particularly decisive when it involves things like space and cyberspace potentially or the nuclear world, for example. This is where our concern about combating WMD, not just maintaining this strategic stability we have with Russia, for example, but combating WMD and especially WMD in the hands of violent extremists or state proliferators are things that we must pay attention to.

I have other concerns but those are the top three that keep me awake at night. Significantly, by the way, when people ask if anything keeps me awake at night, nothing operational keeps me awake at night because of the magnificent people that you see here with me today. Once the missions are in their hands, I stop wor-

rying about it. It is all the things that I am supposed to do to make sure that they have the tools that they need that keep me awake.

Senator NELSON. Thank you.

You made reference to the fact that the President's budget request includes the money to start construction of a new headquarters for STRATCOM. I think you gave us some indication why this is an important investment as part of our national security. Could you maybe expand on that just a little bit?

General KEHLER. Mr. Chairman, STRATCOM performs a unique mission among the Nation's military forces. We occupy a unique place, not only a unique physical place, but we occupy a unique operational place in our Nation's defense infrastructure. We have a unique location here in terms of our abilities to conduct planning, in terms of our capability to do national level command and control of our strategic deterrent forces, in the ability for us to pull together the pieces of our strategic deterrent with our space activities, with our cyberspace activities, with our national nuclear defense activities, to pull all of those pieces together to perform a uniquely important job.

The facilities that we perform that job from today were designed in the early 1950s, constructed in the middle 1950s, and are much like we were talking earlier this morning. The multiple electronic devices that you bring into your house today or have carting around, in my case in my car—I have a lot of different things that I carry around with me. Those have all come along pretty late, and yet none of my infrastructure in my home supports any of that. I have more of those plug-in power strips around my house, for example, than I do have anything else. So that is one example of the facility that we have here not supporting the mission demands any longer.

Power is an issue for us. Cooling air is an issue for us. We have essentially cobbled together over the years a number of systems on top of systems. We find ourselves in a position here where, if we are not careful, we have created a very vulnerable place from either a simple accidental problem with the infrastructure to other more significant problems dealing with cyber threats and other things.

Our assessment has been that for this unique mission we need to go back and reconstruct a new command and control facility, and while we tend to look at that as a building, the building surrounds it. What is important here is what goes in the building and the building that is built to support it. So we have made a budget request that is working its way through your committee and others to essentially bring the infrastructure here to the point where it matches now the mission responsibilities that we have been given.

Senator NELSON. If a terrorist, for example, were able to obtain nuclear materials, plutonium or uranium, build an improvised nuclear device, and blow that device up in a U.S. city, obviously, the devastation would be significant. First, what is STRATCOM's role in making sure that this does not happen? Second, if it does happen, what is STRATCOM's role in responding to that kind of an event?

General KEHLER. Sir, one of the mission responsibilities that STRATCOM has is what we would call collectively combating

WMD. As I said in my opening remarks, the current national security strategy says very clearly that the most significant threat that we are facing today is WMD in the hands of a violent extremist or in the hands of a state proliferator, which is why we are so concerned about North Korea and Iran, for example.

STRATCOM has been given planning responsibilities to be the synchronizer, if you will, for the global planning that goes on in every one of our combatant commands, to include U.S. Special Operations Command (SOCOM). We are given the responsibility to sit, if you will, at the top of the pyramid and make sure that all of the plans fit together. The problem is not unique to STRATCOM. I think if you had the other combatant commanders here, which you have done, I know, in your subcommittee at some length and in front of the full committee, every one of the geographic combatant commanders stated their concerns about proliferation of WMD. It is a concern for all of the combatant commanders today.

Our responsibility is to make sure that all the plans fit together. And we host some planning conferences, which does not sound as important as what it is, where we make sure that all of the combatant commands have the appropriate plans in place to both detect such activity, track it, if necessary, and then offer the President alternatives for how to deal with that if it should ever arise, all the way up to and including U.S. Northern Command (NORTHCOM) which would have the responsibility to assist civil authorities in dealing with the horrible scenario that you laid out for us.

We also have responsibility to work with the Joint Staff and the Chairman of the Joint Chiefs of Staff and the interagency to make sure that our activities are coordinated along with those of law enforcement, the Intelligence Community, and other parts of our Government to make sure that we are all focused on this issue with the attention that it deserves.

Had we been having a conversation here 20 years ago and you said to me, "point out to me the number one plan that is on the top shelf in your office," I would have pulled out our nuclear deterrence master plan, and I would have said, "here it is. This is the number one most important thing that we are doing today."

If you ask me today, I would say there are two plans up there. One would be the nuclear deterrence plan, which always has to be there in my view, but the other would be a plan called "combating WMD." It is our plan to pull these pieces together to make sure that we are in the position, even though we do not have a lot of the forces that would be used to deal with such a problem, that we are in a position that we have the appropriate plans in place and we have either deterred or dissuaded or prevented that kind of thing from happening to begin with.

Senator NELSON. Thank you.

You have touched on this by mentioning North Korea, but let us say countries like North Korea and Iran proliferate WMD, as well as the delivery systems such as missiles. Is there anything in particular that you do in connection with proliferating countries as opposed to, let us say, a terrorist or an effort at an attack?

General KEHLER. For counterproliferation, sir, we are part of a big team that is an intergovernmental team. In fact, that team ex-

tends outside DOD into the rest of our U.S. Government and from there through state and other means to our allies and friends around the world as well.

To effectively counter the proliferation of either ballistic missiles or WMD is a hierarchy of steps that we take. Beginning with treaties, international legal arrangements, norms of behavior, all of those things that would typically fall in the Department of State's realm are complemented by things that would fall within the Intelligence Community's realm, within DOD's realm, and then ultimately at the combatant commander level a series of plans that we could offer to the President if he chose to take action in response to proliferation.

The real objective here is to dissuade it or deter it or prevent it. Those actions are underway through a variety of means. Of course, you are well familiar with your former colleagues, Senator Nunn and Senator Lugar, the actions that have gone on there that have been counterproliferation to try to secure WMD materials around the world, the treaty structure that has surrounded some of these activities as well, and then beyond that, ultimately the activities that would go on in the regional combatant commands and then in STRATCOM, SOCOM, and elsewhere to be supportive of whatever other steps might need to be taken.

Senator NELSON. Maybe you could help us understand a little bit about how the Missile Defense Agency (MDA) actually works and how there would be coordination through STRATCOM and MDA to protect against any kind of an attack, but in the event that there were an attack, how that could work.

General KEHLER. Mr. Chairman, first of all, our U.S. missile defense system is a global system. The national part of this is aimed at a small, very limited number of missiles that would be launched against the United States from one of these smaller state actors. Specifically, our orientation today is on North Korea where they have both demonstrated that they have the capability to produce a nuclear weapon and they have demonstrated in a very aggressive way their ability to field ballistic missiles that today are capable—they have not yet put all the pieces together—of reaching our allies in the western Pacific as well as ultimately the testing that they are doing on longer-range missiles that eventually will have the capability to reach the United States.

Our missile defense system today that is oriented for national defense is intended to deal with that problem and, hopefully, it is a part of our overall effort to dissuade that kind of activity on the part of the North Koreans from having them put all those pieces together eventually.

It also, though, is oriented toward those that are considering going forward here, Iran, for example.

It is not oriented against Russia and China with larger, far more sophisticated arsenals. The way we maintain stability there, although we do not consider either Russia or China an enemy, with their capabilities is through the arms control and stability, confidence-building transparency measures that we have going on elsewhere, and then ultimately through our strategic deterrent force which is still there and sized and shaped to be that stabilizing force and deterrent force, vis-a-vis both Russia and China.

So we work very closely with the MDA. We set the requirements for national missile defense. We do the assessment of its military utility. We are working very carefully with NORTHCOM that would have the responsibility to use that system under the direction of the President and Secretary of Defense if that were ever necessary, and we pull all of the combatant commanders together to make sure that the needs of the warfighters are being met, in particular, now that we have a good start and an effective system in place for national missile defense, to begin to orient that missile defense system now on where the very large threat and real threat is to our forces and our allies, and that is at the feeder level, which is why we have begun to focus as intensely as we have on the feeder-related pieces of this.

Senator NELSON. Our goal is, obviously, to make sure that others know what we can do to prevent their being successful in attacking us. If they understand that we can deter, we can prevent, deflect any effort on their part, hopefully then that dissuades them from trying to go forward and spend additional time trying to find ways to further defeat our defensive system.

Do you think that we have been successful in some respects at least? I understand North Korea is controlled by a very unusual person who does not seem to deal with reality the same way the rest of us do. But apart from that, do you think that we perhaps have been able to dissuade some of the other countries from looking at trying to defeat our systems of defense?

General KEHLER. It is hard to say, Mr. Chairman. There are two things I would say.

First, I believe in the assessment that we have done on our limited defensive posture that we have for the Nation today, I believe that is an effective system, and I believe that system would work as advertised in response to a limited threat. So, number one, the credibility of how others would view it, I think, is linked to the assessments that we have made about its potential effectiveness. I believe that it is to the point where our assessment of this from a military standpoint is that it is effective for the purpose that it is intended. That does not mean that it would be capable of responding to some overwhelming strike. It could not do that, and yet that is why we also still retain offensive weapons to make this a package of things that we would use for deterrence purposes.

The second point I would make is we do not see one-size-fits-all deterrence any longer. We think that deterrence is a combination of things. Missile defense is one piece of that. Offensive forces is another piece of that. Our conventional forward forces is another piece of that. Our ability to command and control is another piece of that. So there are lots of pieces that make up the deterrence equation.

I believe that any potential adversary, certainly nation states, take those factors into account in their decisionmaking. They wind up making their decisions based upon lots of things. It is hard to tell why the North Korean Government makes the decisions that it makes sometimes, but we assume some amount of rationality to other actors out there at the nation state level. My view is that all of them take this into account. How effective it is depends on their own assessment of benefit/risk/reward, and all the things that they

will go through and the behavior that we will see based upon their own decision calculus. But I believe very firmly that they all take all of these issues into account when they are making those decisions.

Senator NELSON. As you indicated, STRATCOM is responsible for implementing the New START treaty with Russia. Your predecessor, General Chilton, was a strong advocate for the treaty. The treaty has now been ratified by the Senate. It is in place. Can you give us your thoughts on how effective you think this treaty may be and what our objectives will be in reducing mutually the arms race and hopefully stop the proliferation in the world of the arms race?

General KEHLER. Yes, sir. First of all, I too am a firm supporter of the New START treaty. The Senate did ratify it. It has entered into force in February. We have 7 years to implement the provisions of the treaty. However, we are moving out to implement those provisions. A number of things are already underway. We have exchanged data with the Russians. We have done other things. There have been some preliminary inspections done. There have been some demonstrations and expositions, if you will. So a number of steps are underway.

We have not yet made final decisions on what our force structure will look like within the treaty limits. The treaty does not require us to do anything other than meet its limits, 1,550 operational warheads, 700 deployed operational launchers, up to 800 deployed and non-deployed. How we structure our force remains to be seen, and that decision process is underway both inside the combatant command here, inside the Joint Staff, as the Chairman is working his way through all of this, ultimately en route to discussion with the Secretary of Defense and ultimately en route to a discussion with the White House over how we should structure our forces.

So we are moving forward. I think the single, most valuable thing about the treaty is that it does, in fact, place limits on those weapons that threaten the United States of America most significantly and most immediately. So that was a very positive step.

A second very positive step is the fact that we have a treaty with the Russians at all. I think that what that does is it creates a dialogue with the Russians. We have found that to be a useful dialogue from well before the end of the Cold War. We have found that that is helpful for transparency reasons. It forces us to deal with one another on all kinds of levels, and it, in fact, allows us to continue this pathway that we have been on with the Russians since before the end of the Cold War, which is to reduce the overall number of weapons in a way that promotes stability and yet continues to allow us to have the strategic deterrent force that we think we need to meet our deterrence objectives. I see all of those as positives, and we see this as a positive way forward to work the implementation details as we decide what that force structure should ultimately look like.

Senator NELSON. I think there were a lot of questions raised during the debate on the floor of the Senate about the treaty, whether or not there would be enough nuclear weapons for our offense and defense. So I guess the question is are there enough for our mutually assured destruction given what Russia will have and what we

have, which is not our goal, but there was some concern that we are getting down to maybe a manageable level but an unsafe and insecure level.

General KEHLER. Sir, I do not think we are unsafe or insecure at all given the levels in the New START treaty. I would not characterize this any longer as mutually assured destruction. That means a lot of things.

Senator NELSON. It is still something to think about.

General KEHLER. Yes, sir. That means a lot of things to a lot of people.

What I would say is that at this force level that I am confident that we can meet our deterrence objectives. The force level that was agreed to and the assessments that were made which were prior to my time but which I fully agree with—those assessments were made based upon a series of deterrence objectives that have been in place for quite some time. The next step is to go back and look, and the NPR said that we would do this. Once the New START treaty has been put into force, now the question is, what is next. So we have begun to work with the rest of DOD and others to think our way through what is next.

Senator NELSON. There was also a question about whether or not this would, in the words of President Reagan, permit us to trust but verify, and being able to have a certain level of verification was, in fact, part of what this treaty was about. So are you comfortable with the ability that we have to verify what Russia is doing as they would have the ability to verify what we are doing, as I described it, looking under each other's hood of the vehicle to see what is there?

General KEHLER. Yes, sir. I am comfortable with this. I believe that the verification mechanism that was put in place for this treaty fits the treaty. There was some discussion about whether this verification process would have fit the last treaty, and the answer is it would not have but it does fit this one and I am comfortable with it, with the provision, of course, that we continue to source those verification methods to include the national technical means that we use to help us enforce the verification provisions of the treaty.

Senator NELSON. Turning to the area that I think a lot of people are paying close attention to or beginning to learn about, cyberspace, you referred to the Cyber Command as being a subunified command under STRATCOM. Maybe you could help us understand exactly what a subunified command is. We are all trying to learn how to speak the military language. I do not know that I have mastered it all, but I am trying to learn more about it.

General KEHLER. Sir, I can just say as an aside, the military people in here have not mastered it all, I can guarantee you. [Laughter.]

We stand up a subunified command when there is a specific mission responsibility that requires focused attention is, I think, the best way to say it. For example, U.S. Forces-Korea is a subunified command to the U.S. Pacific Command. We stood that up years ago because there is such a unique set of challenges associated with what is still a standoff, of course, on the Korean Peninsula that we

felt it was necessary to put a separate senior officer in charge of worrying about that every day, 24 hours a day.

We did the same thing for U.S. Forces-Japan some years ago, and we have done that from time to time over the years when a specific issue was significant enough, required such detailed activities and awareness and specific responses that it required the full-time attention of a senior officer every day.

That is what we have done in this case with cyberspace. We have stood up U.S. Cyber Command as a subunified command. It is commanded by a four-star officer, General Keith Alexander, of the U.S. Army. He wears another hat as well as the Director of the National Security Agency. The headquarters is at Fort Mead. That is a center of gravity for this kind of activity for the Nation that we have charged him. In fact, we have delegated the responsibilities that are given to STRATCOM to operate and defend DOD's networks. We have delegated those responsibilities to him, and what we find is the uniqueness of cyberspace demands that kind of attention where we have made, I believe, very good progress. Certainly we have a long way to go but we have made very good progress.

The other thing this does is it gives a specific focal point for the rest of the government to interact with when they are talking about how do we do cyberspace business as a complete government. It also gives a way to reach out to commercial. As you well know, sir, the Department of Homeland Security (DHS) retains responsibilities here for defending the Nation's critical infrastructure, to include the cyberspace critical infrastructure. What we are trying to work our way through with Cyber Command is not how do we completely reinvent the role of the U.S. military related to cyberspace, but how do we apply our traditional military activities to cyberspace. That is everything from defense support of civil authorities to protecting our own DOD activities to conducting military operations.

So Cyber Command is in the thick of all of that conversation. We are, of course, working with them from STRATCOM. In fact, yesterday we spent an entire day, both staffs together, back at Cyber Command headquarters outside of Washington. I think that putting a subunified command together for this subject at this time has been exactly the right thing to do.

Senator NELSON. Statistics are now showing that criminals engaging in cyber crime make more money today in that cyber crime than via the drug trade for the first time. Obviously, we have to deal with criminal efforts in cyber or terrorist activity that could be criminal but for a different purpose not necessarily for profitability but to try to destroy our networks to adversely impact us.

In working with DHS, how does this work? If you are not reinventing the wheel, trying to work with DHS, which would be concerned primarily, not entirely, with terrorists but with cyber crime, how do you distinguish or how do you divide up those responsibilities or follow up after they are discovered?

General KEHLER. Sir, first of all, those relationships are still being established. There has been a memorandum of agreement signed between DHS and DOD that lays out an initial relationship between the two departments. I think it is important to note that the Department of Justice (DOJ), for example, is a key player in

all of this as well. There are other Federal departments that are also key players in here, and so the question is really one of relationships across the entire Federal Government.

But let us take the DHS example for a second. Our friends in NORTHCOM and Admiral Sandy Winnefeld who commands that command today—we have worked through a series of relationships that allow him to do what we would call defense support for civil authorities. He supports DHS in the physical world in many ways whether it is from wildland fire fighting, whether it is flood activities, whatever it is where DHS turns to DOD and says, "I need help, you have unique capabilities, unique tools that we need, unique manpower, unique training, whatever it happens to be, and we need that to support civil authorities and their activities." This is the same set of lanes in the road, if you will, that we need to carve out with DHS for cyber. It is different in that cyber is a different animal for us to deal with, but I am confident—and I think we are all confident—that we can establish those relationships.

You asked how would we respond. In some cases, those relationships are in place today, and we have ways to respond. In other cases, they are not. If you listen to the conversations that go on from our Deputy Secretary of Defense and others, I think we would all acknowledge today that there is much more to do to position the Nation to be able to deal with cyberspace in terms of the amount of activity that we see from all different directions.

But I think the final point I would make here is very significantly, in some cases things that happen in cyberspace, while the press headlines might use the word "attack," when the word "attack" is used for people like us with uniforms like these, that means something to us that is not always necessarily the same thing we mean when we talk about attacks in cyberspace. In some cases, as you pointed out, those are criminal activities and best handled by our criminal activity handlers, whether that is the Federal Bureau of Investigations or whether that is local law enforcement or whether that is the State patrol or whatever, whether it is DOJ. Those are the kinds of questions that we are asking ourselves to make sure that we are not wanting to pick up the phone and call DOD for the wrong reasons.

Senator NELSON. This is sensitive because I am going to make reference to China. There have been a lot of penetrations of U.S. Government and industrial computer systems with data theft that have been traced back to China, and while it is not possible to determine with certainty that these attacks are coming from or directly directed by the Chinese Government, the evidence over a number of years might cause some people to draw that conclusion. But at a minimum, if these attacks are not sponsored or officially sanctioned by the Chinese Government, it appears to most of us that the Chinese Government has done little or nothing to stop them, almost reminiscent of intellectual property theft as well.

Is this something that is being looked at? I know it is a very delicate sort of a question, but is this something that is being looked at right now militarily? If you can even answer that in this environment.

General KEHLER. Sir, what I would say is about a week and a half ago, maybe 2 weeks ago, the White House released a docu-

ment. I may get the title a little bit wrong, but I think it is called "The International Strategy for Cyberspace." I think that is what it was called. If it was not called that, that is close.

One of the highlights of that document is the idea that everyone will have to behave responsibly in cyberspace, that there is some expectation that to get the benefit out of cyberspace, that people will behave responsibly. I think that gets to your point here, that there needs to be responsible behavior at all levels.

I will not comment on the specifics of any country, et cetera, because the other thing that you pointed out with your question is how difficult it is to determine who is doing what in cyberspace. Ambiguity is almost a hallmark of people's behavior in cyberspace. That is not a bad thing because we all want our privacy, of course. But it provides us with some difficult problems in trying to attribute behavior to various actors out there. So that is going to be a problem for us, I think, to work our way through for quite some time to come.

Senator NELSON. Is that something that we could gather as a group of countries who have this capability as governments? We recognize there are private citizens located all around the world that have the capabilities that sometimes astound us that individuals would develop those levels of capability. But is that something where you think we might, as we have with the New START treaty, enter into some sort of an agreement with other countries where it is actual signatories to try to police that back home, wherever we possibly can, whether it is our country or another country?

General KEHLER. Mr. Chairman, I do not know what the mechanism would be, nor would I suggest a mechanism to do it. But I would say that the new national strategy suggests that we need to band together in some way as some type of a community of nations to make sure that our behavior is consistent with what our objectives are for the Internet, which is free and open activity for everybody.

The interesting thing here is going to be, I think, whether by engaging nation states, you have everyone that you need in such an agreement. If you think about some of the issues we have seen in the last several years, there have been a couple of cases where we have non-nation states accusing nation states of bad behavior. So you have companies accusing nations; nations accusing companies. This is going to be very interesting, I think, for policymakers to sort out who you include in these kinds of agreements, which is why I think the strategy for cyberspace was pretty insistent on this idea that everyone has to behave responsibly.

Senator NELSON. There is the distinction that we talked about between that that is just criminal for profit type efforts versus terrorists or nation state efforts that are the equivalent of spying to try to access our secrets and inveigle their way into our systems.

General KEHLER. Yes, sir. Vandalism, criminal activity, espionage, military activity, all of those things are happening in there at some level, and sorting all that out is one of our big challenges.

Senator NELSON. I mentioned and you mentioned as well space debris. Can you give us some relative understanding of how much stuff is up there? Obviously, we think of space as being unlimited

and we think about it as expanding the globe. How congested and contested is space right now with all that debris?

General KEHLER. I think two things that I have seen that have been really dramatic changes in my time on Active Duty, one was, of course, the end of the Cold War and the reduction of our nuclear forces. The other has been the change in space from the start of the Space Age which, of course, I was not on Active Duty for, but from the late 1950s to today, how much the nature of our space activities has changed, how much our reliance has changed on those space things, how much the participants have changed, and how much the number of manmade objects has changed.

So if I just focus on the objects for a second, I think in 1957 there was one manmade object on orbit. Today we are sitting here in 2011 and there are well over 20,000 manmade objects. About 1,000 of those are active satellites. So 19,000-plus pieces of debris of one kind or another. That is those things that we can see, some sized around a softball or so larger. Our estimates are that there are probably 10 times that amount of debris that is smaller than what we actually actively would look at on a case-by-case basis. So pretty soon we are talking about a lot of objects here.

You would say big space, little object theory, but you have to think about this, that there are some places on orbit that are more crowded than others, that are more desirable than others, not unlike driving. There are a lot of cars that transit Nebraska, but most of them are on the interstate, I would hazard a guess, and a lot of them go through the intersection out here of I–80 and 480. So that is the same thing on orbit, that there is a lot of stuff up there but it is channeled in certain places, and in some places it goes through intersections.

So that in and of itself is a risk, first, to human space flight, and we put a protective observation bubble, if you will, around the Space Station and human space flight. Second, we put an observation bubble, if you will, around our active satellites, and then we are in agreements with others around the world to provide that kind of service for them as well.

The final thing about this that makes it so potentially damaging is the speed at which things are traveling on orbit. Even though they are small objects, they are going at a very high speed, and therefore impacts cause a tremendous amount of damage. When you are talking about things moving at 17,000 miles an hour, for example, collisions that occur at those speeds—that is faster than .30–06 round, by the way, that would go down range. Those kinds of speeds are particularly damaging if you talk about the unintended collision.

Senator NELSON. In addition to worrying about space debris, we also have to be concerned about our adversaries perhaps trying to bring down or jam our satellites. What are we doing in a general sense to protect against having somebody, another country or a bad operator, find a way to effectively render inoperative one of our military satellites?

General KEHLER. Sir, the threat to our space capabilities is real. The threat that we are concerned about is predominantly a ground-based jamming threat, for example, GPS. GPS, as universally used as it is, is essentially in its orbital component a radio transmitter.

It does not transmit at particularly high power, and so it is not a terribly difficult signal to jam, if you have the right pieces of equipment in place. So jamming is one of the issues.

We see the development of jammers in militaries around the world. We know Sadaam Hussein in the early days of Operation Iraqi Freedom actually operated GPS jammers. They were not effective. He did not have many of them and they were not used particularly well. They were not employed effectively, and ultimately they were taken out.

But we see a proliferation of jammers. We see satellite communications jamming. Sometimes we see that today in an unintentional way because the frequency spectrum is getting more crowded, but we have also seen it in an intentional way as well.

Then, of course, we have seen the demonstration by the Chinese and we had seen years ago the demonstration of anti-satellite weapons by the Russians. So we know that those types of capabilities exist out there in the world and we have to be mindful of those. So we are taking a number of steps.

At some level, some of this is an engineering solution.

We have to design the satellites differently. In some cases, they are pretty well protected today from a lot of things, but they are not protected against everything. We get into difficulty in determining what those other satellites that are on orbit—what is their real purpose? They can all look like communications satellites, but that may not be their purpose. So we have a better job that we have to do in situational awareness so we get advance warning of things that could happen, and then we can take some additional protective steps. In some cases, we have not put much in the way of protective steps in place. Resilience in the capability will come maybe from airborne platforms or elsewhere instead of space.

Senator NELSON. There is a certain amount we can do to protect. Whatever we do can in some way or another be defeated if the other side develops the capacity to do that. We cannot protect anything and everything.

General KEHLER. No, we cannot. Resilience is the ultimate way to take care of these vulnerabilities. That is true in cyberspace as well. But ultimately mission assurance, which means that you can operate through something even in the face of duress of some kind, and then resilience, multiple ways to get the job done, is really the way that we are ultimately trying to get at these vulnerabilities.

Senator NELSON. This question is about our men and women in uniform who are part of the STRATCOM. On any given day, how does STRATCOM support our troops in, let us say, Afghanistan?

General KEHLER. Sir, I tell my colleagues in the other combatant commands—and I actually believe this firmly—that there is no military operation that goes on out there that is not being impacted by STRATCOM in some way. The number one example is GPS. There is not a military activity that is going on out there somewhere today that is not impacted or touched somehow by GPS. Satellite communications is another one that there is either voice traffic or data going over satellite communications somewhere in the world right now in large volumes that is supporting military activities. We are providing the networks over which their data and communications are flowing. We are providing a strategic umbrella, I

believe, a deterrent umbrella over top of them. We are ensuring that the missile defensive capabilities that they need are in place and effective. We are taking steps with them to combat WMD. We can provide expertise forward when they need expertise. We can provide other planners that go forward to conduct, for example, global strike operations.

Let me use a couple of examples here. You asked about Afghanistan. The reason I believe that we can operate the way we do in Afghanistan is because of space and cyberspace. It allows our troops to navigate with accuracy. It allows them to communicate with certainty. It allows them to strike with precision. It allows them to do those kinds of things that have essentially become the American way of warfare in a place like Afghanistan. It allows troops to operate in geographically dispersed locations, which we do in Afghanistan. It allows us to put forward operating locations in places where their only communications might be through satellite communications means. It allows us to fly remotely piloted aircraft using a combination of cyberspace and space so that you do that half a world away. All of those things are either provided by the Service components of STRATCOM or somehow planned via a global synchronization effort through STRATCOM.

Finally, in the early stages of the Libyan operations, STRATCOM conducted, on behalf of U.S. Africa Command, global strike operations as well.

I believe we have a supporting role that we live every single day with those forward commanders that are out there. We are touching them in ways that they do not really realize we are touching them in. We are also helping to manage the global intelligence, surveillance, and reconnaissance assets that they are relying on every minute of every day.

I feel very proud of the men and women of STRATCOM and what they do not only when we are supported in our efforts to deter the strategic end of the spectrum, but also in the supporting activities that they put out to support what they would call the warfighters. I think you would find that if you went around and talked to any STRATCOM assigned people today in any of our operating locations, they would say that they are there for that. So I am very proud of them.

Senator NELSON. I think the American public is probably fascinated with the unmanned aerial vehicles and the way in which they operate. Could you give us maybe a little bit of an overview of how you can operate a machine halfway around the world with precision and that it does not have to be operated like a model airplane with a local control right on the ground close to the vehicle?

General KEHLER. Yes, sir. Well, actually it does.

It is both.

Senator NELSON. Yes, it can be both ways, but it does not have to be.

General KEHLER. Right.

The way I think about it, sir, is I split it into two pieces. One is actually flying the aircraft itself. The other is operating the sensors or the systems that are on the airplane.

So to do the airplane operations in the immediate vicinity of the airfield, we do it a lot like a model airplane. There is somebody

there in the local vicinity to get it airborne and bring it home when it is on final approach, if you will. But the whole rest of that operation is being flown remotely. The vehicle itself is being flown by a pilot who is remote, and sitting next to that pilot is a sensor operator or a mission operator of one kind or another. That is all being done through cyberspace. It is all being done through a network. It is all being done through a combination of things, by the way, which is some military pieces, but mostly it is commercial pieces. There is probably a commercial satellite link that is involved in there somewhere. There may be some commercial fiber optic that is involved in there somewhere which, by the way, reinforces with us why the nature of cyberspace is largely in the civil and commercial domain when we use it. We are talking about protecting ourselves in cyberspace. A very interesting point of contact between DOD and the other departments and commercial industry is in just that kind of a thing for just that kind of a purpose, for example, flying remotely piloted aircraft.

That is the way it is done. It is done from places that are relatively small rooms. I know you have seen some of them and been with the crews that do that. What strikes me is if they are flying over Afghanistan, if you enter a shelter with them and close the door behind you, you do not know where you are. After a while you forget that you are in the United States somewhere. You are not in Afghanistan with them. You are not where the vehicle is. After a while, I think the mindset that the people have that do this is the same.

That goes all the way out to the tactical level. There are some smaller vehicles that are flown at the tactical level. There are some that are actually flown like model airplanes from some person forward on the ground who is doing almost the same thing that we did as kids, but they have sensor packages on them that allow them to see and perceive things that are out there that might be threats.

I think it is a remarkable testament to space and cyberspace that we do those things today.

Senator NELSON. It is a little bit like science fiction. There is no fiction to it but there is a lot of science associated with it.

This question relates to the fact that STRATCOM is very technically oriented and requires a lot of dependence on scientists and engineers and other people with a high degree of technical specialty. Are we seeing enough young people and others in the educational system today who are taking that kind of background coursework to fill the needs that we are going to have tomorrow and the next day and the day after that for the kind of capacity that STRATCOM has in the future that is not that very far ahead?

General KEHLER. No, sir, I do not think we are seeing enough. It may very well be that if we were to visit the major universities around the country—and certainly we have had a little bit of this conversation with the University of Nebraska—I think you would find that they are producing high quality engineering students, and I think you would find that every one of our major engineering schools around the country are producing high quality engineering students and I think you would find that they are producing maybe significant numbers of them. I think you would find that of those

numbers, the percentage who stay in the United States and enter the national security business is way too small. So there are interesting issues here with recruiting, with retention, with making sure that we have identified what skills we need, and making sure that we have put in place the incentives, I think, for people to enter the national security business and stay there when it is a little more difficult to do that.

NASA is shifting its directions and is in a period where we are coming to the end of the Space Shuttle. There is going to be a period of time here as they are reorienting to go off and do some other things.

I think it is going to be a challenge for us to attract and retain the kinds of people that we need. Cyberspace is another one of those areas and particularly when there is highly competitive demand on people to go to industry as well. So I think educating them, keeping them, going back to the secondary education as well and then post-secondary is something that is very concerning for us.

Senator NELSON. It is something that obviously we need to work on because if we do not have the workforce coming into the command, we are not going to be able to continue the command as it is or we will have to structure it differently and that is not in anybody's best interest. So I hope that we can keep pushing to get that kind of effort and capacity growing. Otherwise we will not have any seed corn and we definitely have to have that.

General KEHLER. Yes, sir.

Senator NELSON. STRATCOM is responsible for, as we talked about, the intelligence, surveillance, and reconnaissance, or as it is referred to in military terms, ISR. We know that ISR played a role in the successful raid that took out Osama bin Laden. Can you talk about any kind of support that STRATCOM might have provided in that mission?

General KEHLER. Sir, not really.

Senator NELSON. You can say that we had some involvement. You just do not have to say what it is.

General KEHLER. We did have some involvement. We provide involvement across the board to the activities in CENTCOM all the time. So most of what we do for ISR, anyway, in those forward areas is planning and recommendations on what assets they should get. How they use them and what they are using them for is not always apparent to us.

Senator NELSON. That is my final question. Is there anything that I did not ask that I should have asked?

General KEHLER. No, sir. Thank you for the opportunity to appear again.

I will say again in closing, on behalf of the men and women of STRATCOM, we certainly appreciate the support of Congress. We appreciate the support of the entire Senate Armed Services Committee and your support and your subcommittee, in particular. These are difficult issues and you know and I know both that there will be fiscal pressures as the President's budget works its way through.

I would just make one final advocacy comment about the need to sustain the funding that is in the President's budget, particu-

larly for these critical items related to sustaining our nuclear forces, the nuclear infrastructure that backs them up, the command and control systems that we have in place, our need to increase both our space and cyberspace situational awareness and the investments that are there to do that, the investments that we have in place to sustain our force.

Then finally, I would remind all of us again that those steps that you all have taken to support the men and women who actually are the heart and soul of what we do—the hardware is one thing. But it is not the hardware that ultimately is important. It is the men and women that are in STRATCOM and throughout the rest of our military. So the support that we have for them I would continue to advocate in the strongest possible way.

Other than that, sir, thanks for the opportunity.

Senator NELSON. Thank you, General Kehler, for your very candid remarks and responses to questions. Thank you and the men and women of STRATCOM for their service to our country, to wish you and all of them the very best and to thank the young men and women who are here with us, as well as the Fighting 55th and the "Weather Command" as well.

The colonel was quick to point out that it is the Chaplain who is responsible for the rain. [Laughter.]

So thank you so very much.

I also want to thank the staff here at this wonderful facility, once again, for hosting one of our field hearings. We thank you.

We thank all who are here and hope that you have perhaps some idea, if not a better idea, of the role of STRATCOM which we are all so proud is located here in this part of our wonderful State. We hope that we will be able to continue to have hearings of this kind for transparency and for enlightenment to the men and women who are relying on this kind of protection for our national defense and the taxpayers who continue to support them. Thank you all.

The hearing is adjourned.

[Whereupon, at 12:55 p.m., the subcommittee adjourned.]

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