S. HRG. 113–108, PT. 7

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 2014 AND THE FUTURE YEARS DEFENSE PROGRAM

HEARINGS

BEFORE THE

COMMITTEE ON ARMED SERVICES
UNITED STATES SENATE

ONE HUNDRED THIRTEENTH CONGRESS

FIRST SESSION

ON

S. 1197

TO AUTHORIZE APPROPRIATIONS FOR FISCAL YEAR 2014 FOR MILITARY ACTIVITIES OF THE DEPARTMENT OF DEFENSE, FOR MILITARY CONSTRUCTION, AND FOR DEFENSE ACTIVITIES OF THE DEPARTMENT OF ENERGY, TO PRESCRIBE MILITARY PERSONNEL STRENGTHS FOR SUCH FISCAL YEAR, AND FOR OTHER PURPOSES

PART 7
STRATEGIC FORCES

APRIL 17, 24; MAY 7, 8, 9, 2013

Printed for the use of the Committee on Armed Services

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DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 2014 AND THE FUTURE YEARS DEFENSE PROGRAM

WEDNESDAY, APRIL 17, 2013

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

NUCLEAR FORCES AND POLICIES

The subcommittee met, pursuant to notice, at 2:30 p.m. in room SR–222, Russell Senate Office Building, Senator Mark Udall (chairman of the subcommittee) presiding.

Committee members present: Senators Udall, Sessions, and Fischer.

Majority staff member present: Jonathan S. Epstein, counsel.

Minority staff member present: Robert M. Soofer, professional staff member.

Staff assistant present: Lauren M. Gillis.

Committee members' assistants present: Lenwood Landrum, assistant to Senator Sessions; and Peter Schirtzinger, assistant to Senator Fischer.

OPENING STATEMENT OF SENATOR MARK UDALL, CHAIRMAN

Senator UDALL. The Subcommittee on Strategic Forces will come to order. This afternoon we will receive testimony from the Department of Defense (DOD) regarding nuclear matters for fiscal year 2014. Let me thank all of our witnesses today for taking time from your busy schedules to testify.

Let me start with a quick administrative note. Following this open session, we will move to the Office of Senate Security in the Capitol Visitor Center, Room SVC–217, for a closed session. To accommodate that, I'd like to wrap up this open session by 3:30 p.m. So then I'd ask that we go straight into questions after Senator Sessions and I make some brief opening remarks here. If you have any opening statements, we'll be happy to enter those into the record.

In that spirit, I'm going to keep my remarks very brief. I want to start by saying that I'm honored to chair this subcommittee and to work with the distinguished ranking member, Senator Sessions. He is deeply rooted in these policy matters and he's going to have

to train me over these next months as we work together and create a partnership.

I don't have to tell you here today that the Strategic Forces Subcommittee oversees some of the most critical and sensitive elements of our national security infrastructure. Colorado and Alabama have key roles to play in those no-fail missions. I'm looking forward to working with Senator Sessions and all of our members in the bipartisan fashion that's been a hallmark of the Senate Armed Services Committee (SASC) and this subcommittee for many years as we pursue our important work.

With that, let me make some short comments regarding the fiscal year 2014 budget. The 1251 Report, which was originally required by the 2010 National Defense Authorization Act (NDAA) and then was revised in section 1043 of the NDAA for Fiscal Year 2012, is required to be part of the President's annual budget submission. The report gives a 10-year projection into the investments being made in our nuclear deterrent by DOD and the Department of Energy (DOE).

As was the case last year, the report is late and we understand it may be June before we see it. I believe that Chairman Levin and Ranking Member Inhofe intend to mark up the SASC bill in June, so I'll be asking Assistant Secretaries Creedon and Weber to talk about that issue, explain what happened, and give us some idea of when Congress might see the report.

The fiscal year 2014 numbers do show that even in times of sequestration we are making the best possible effort to move forward with a strategy to keep our deterrent maintained. The fact that we were able to fly our B–2 and B–52 bombers in the recent joint exercise Full Eagle with South Korea was an important sign of the many nations that rely on the U.S. deterrent as a part of their overall national security strategy.

I want to commend today's witnesses, those that serve under them, and DOD as a whole for the hard work put into that effort. I know it was not easy, but it was important.

On a final note, to my knowledge, Congress has yet to see any changes to the nuclear force structure as a result of the New Strategic Arms Reduction Treaty (START). We thought that was coming in the fiscal year 2013 budget, but we're still waiting for that information. It is important—I know my ranking member agrees—that the commitments made as a part of New START are upheld, so I'll be looking for some updates on when that guidance might be expected.

Finally, I would like to say a word of thanks to all of our witnesses for your longstanding commitment to ensuring the safety and surety of our nuclear deterrent. You and the military men and women that you lead do demanding and often unsung work to keep our country safe around the clock. Thank you for your service.

With that, let me turn to Senator Sessions for his opening statement and then we'll move on to questions.

STATEMENT OF SENATOR JEFF SESSIONS

Senator SESSIONS. Thank you, Senator Udall.

It's a pleasure to have you here.

In a very odd way, perhaps, I believe what we'll do this year, maybe next year, is very significant as to what our nuclear situation is going to be in the years to come, because there's real ambivalence in the White House, there just is. I was disappointed and concerned about the Secretary of Defense. He answered the questions pretty well at his confirmation hearing, but the Nuclear Zero report I consider well outside the mainstream of American nuclear policy.

Senator Ben Nelson and I were passed "America's Strategic Posture," the final report of the Commission on the Strategic Posture of the United States. We required that because we thought the Cold War is over and the war on terrorism was evolving and our weapons are aging; what are we going to do? So we put the best minds in the world—you had William Perry, who challenged nuclear weapons, he thought we could reduce nuclear weapons. He was Secretary of Defense under President Carter; James Schlesinger, who was—Perry was Clinton's and Schlesinger was Carter's and Reagan's. You had John Glenn, Morton Halperin, Lee Hamilton, Fred Ikle, Keith Payne, and James Woolsey.

They came out with a report that acknowledged changes, but concluded we should maintain basically our bipartisan long-term strategy for defending America and that nuclear weapons weren't obsolete, they do play a role in the world today that cannot be wished away, that our allies are worried about our commitment with regard to nuclear weapons to protect them and to use them, and we're behind on modernization, which they said had to be fixed.

So they reached a very valuable bipartisan recommendation, and then with New START, as you mentioned, we reached an agreement that, with the President, to begin the modernization proliferation. We talked about, had a commitment to funding.

I have acknowledged—but I don't want to see this as any kind of weakness in my view, but, Mr. Chairman, I've acknowledged that maybe we don't need to build, spend $10, $11 billion on two buildings. I saw the biggest steel mill, the virtually newest, the biggest industrial project in the United States, several years ago. It was near my home town. It was a $4.7 billion steel mill. It was unbelievably big. So to say each one of these buildings are going to cost more than that made me a bit nervous.

I'm not saying we can't save some money. But the production, the ability to guarantee that we modernize and be able to produce new pits and do the things that are necessary has to be there. I'm willing to work with you if we can keep the costs down some, but I really think that we're going to have to—if we're not able as a Nation or as Congress and the administration to reach an accord on this, it may become a big issue for us. We may have to have a big national discussion about this whole issue and take the cases to the American people and see where it comes out. We've been able to avoid that for a long time. We've had a pretty much bipartisan agreement.

So, as I raised it with the Secretary of Defense and the Chairman of the Joint Staff this morning, we are behind on the ballistic missile submarine and the air-launched cruise missile by 2 years. The decision has not been made on the follow-on intercontinental

ballistic missile (ICBM) program, the Service Life Extension Program (SLEP) for the B61 bomb, and the W88 and W77 warheads are 2 years behind schedule.

So we want to talk about where we are on these programs, because if this continues then we will have reached a permanent fall-behind level and I think it would be hard to catch up.

Thank you for letting me go a little bit longer than I would normally do. But I've tried to just lay out the fact that we'll have an important year, Mr. Chairman. You're not new to all these issues and you know what's going on. So I look forward to working with you.

I would just say this. As I said at an international conference, nuclear weapons in a limited number of nations' hands cannot be said to have caused wars or certainly it hasn't caused a nuclear war yet. There's been a certain degree of uneasy stability in the world, but it's been stability to the degree we normally haven't seen throughout history.

I think a case can be made that nuclear weapons are a force for good, but if we allow North Korea to have them and Iran to have them and then the South Koreans and the Japanese and the Saudis and the Egyptians—everybody wants nuclear weapons and we have a problem out there. If we keep reducing our numbers and it gets so low that a competing nation thinks, "we can be a peer competitor of the United States of America, we can build that many weapons and put us in a situation that creates instability in the world that doesn't now exist."

So as we wrestle with how to make the world a safer place, let's be careful we don't do something that's counterproductive.

Thank you.

Senator UDALL. Thank you, Senator Sessions.

We're going to, if it's acceptable to the Senator from Nebraska, go right to questions. We want to welcome the Senator from Nebraska to the subcommittee, to our first hearing of this Congress. We know Nebraska has long had an influence in this subcommittee and we look forward to working with you.

I'm certainly inclined to defer to you if you'd like to start off the questions, Senator Fischer. I know your time's valuable. Senator Sessions and I will be here for the entire hearing, but if you'd like to begin by asking some questions, please, the floor is yours for 5 minutes.

Senator FISCHER. Thank you, Mr. Chairman. It is an honor to be on this subcommittee. It is a very important subcommittee, not just for our country, but also for the State of Nebraska. So I thank you for your kind welcome. It's good to be here, and thank you, Ranking Member Sessions, as well.

There's just a couple of things I wanted to touch on today, if I could. First of all, with the Minuteman III ICBM. Madam Secretary, if I could visit with you about that, I'd appreciate it. Exactly a year ago your prepared statement before the House Armed Services Committee stated: "A 2-year Air Force study examining options and required capabilities for a follow-on system is nearly complete." This year your statement reads: "A 2-year Air Force analysis of alternatives, examining options and required capabilities for

a follow-on system ground-based strategic deterrence is projected to be complete in 2014."

So have we examined the options and required capabilities for that follow-on system?

STATEMENT OF HON. MADELYN R. CREEDON, ASSISTANT SECRETARY OF DEFENSE FOR GLOBAL STRATEGIC AFFAIRS

Ms. CREEDON. Thank you, Senator, and I will also ask General Kowalski to weigh in on this as well as he's closer to the actual conduct of the study.

I know this has taken a lot longer than we anticipated, but one of the things that we want to make sure that we fully examine is all the options. So that ranges from a complete replacement to additional ways to extend the current 2030, which is when the current system in its present condition will be sustainable.

One of the other things that is also going on in the context of the Air Force, which is also a little bit why this study has taken a bit longer, is the Air Force is also very carefully analyzing exactly how the current system is degrading, so that they have a much better understanding of how they might extend the life of this if that is the alternative that's chosen.

So we really need to do this, finish the study. As the President has said, this is an integral part of the triad and the present policy, obviously, is to maintain the triad.

[The prepared statement of Ms. Creedon follows:]

PREPARED STATEMENT BY HON. MADELYN R. CREEDON

Chairman Udall, Ranking Member Sessions, distinguished members of the Strategic Forces Subcommittee, thank you for the opportunity to testify today on our nuclear forces and the policies and programs that support them. I am pleased to join assistant Secretary Weber, Lieutenant General Kowalski, Rear Admiral Benedict, and Major General Harencak who are here today for this discussion.

The Office of Global Strategic Affairs (GSA) leads the Department of Defense's efforts to execute the President's vision toward a world without nuclear weapons, while recognizing that as long as nuclear weapons exist, the United States must maintain a safe, secure, and effective nuclear deterrent. The great men and women of GSA lead the Department's work with our international allies and partners to ensure and strengthen stability and deterrence in the international system. GSA is also responsible for policy development on a range of issues, including countering the proliferation of weapons of mass destruction (WMD); ballistic missile defense; and dealing with the emerging security threats in the cyber and space domains.

I will address a number of issues today, including the global strategic balance; progress and force structure under the Treaty between the United States and the Russian Federation on Measures for the Further Reduction and Limitation of Strategic Offensive Arms (New START); the 2010 Nuclear Posture Review (NPR) implementation study; budget uncertainties; force modernization; and nuclear command, control, and communications. Additionally, I stand ready to answer any questions that the subcommittee may have.

GLOBAL STRATEGIC BALANCE

The United States has come a long way from a high point of approximately 31,000 nuclear warheads at the height of the Cold War in 1967 to about 5,000 in our stockpile today. The number of deployed strategic nuclear warheads reported under New START for the United States as of March 1, 2013 stands at 1,654. For the Russian Federation, the figure is 1,480. By any measure, this represents significant, demonstrable disarmament progress.

Reporting and inspections that are done under New START have given us a strong understanding of deployed Russian strategic nuclear weapons, but we have significantly less confidence in the numbers of Russian non-strategic or "tactical" nuclear weapons.

Russia also maintains a robust nuclear warhead production capability to regularly remanufacture warheads rather than conduct life-extension programs, as the United States does. It is also modernizing its delivery systems. It is fielding a mobile variant of the Topol-M intercontinental ballistic missile (ICBM), a new Borey-class missile submarine with Bulava submarine-launched ballistic missiles (SLBMs), and replacements for its nuclear air launched cruise missile (ALCM). It is also developing a new heavy ICBM to replace aging Cold War-era systems, which is planned go into service by the end of this decade.

China continues to invest in nuclear weapons and delivery systems in order to enhance the mobility and survivability of its nuclear deterrent. Its broad range of missile-development programs includes an effort to replace some liquid-fueled systems with more advanced solid-fueled systems. It is also pursuing a sea-based deterrent with the development of the JL–2 submarine launched ballistic missile intended for deployment on the Type-094 Jin-class ballistic missile submarine. Although China continues to upgrade its nuclear missile force, we estimate that it has not substantially increased its nuclear warhead stockpile in the past year, since I last briefed this subcommittee.

Iran continues to defy the calls of the international community for transparency into its nuclear activities. Its refusal to cooperate fully with the International Atomic Energy Agency (IAEA) and the possible military dimensions of Iran's nuclear program continue to heighten U.S. and international concerns that Iran is pursuing the development of a nuclear-weapon capability.

North Korea continues to violate its international obligations and commitments, including denuclearization. Its announcement on February 12, 2013 of a third nuclear test, following on the heels of its December 12 Taepo Dong-2 launch, and its subsequent threatening rhetoric are the latest reminders that North Korea's nuclear and ballistic missile programs, and proliferation activities, pose threats to U.S. national security, Asia-Pacific regional security, and nonproliferation efforts worldwide.

The array of nuclear-armed or nuclear weapons-pursuing states around the world certainly complicates the global security environment. The United States and Russia together, however, still account for a vast majority of the world's nuclear weapons, even after the central limits of New START are reached in February 2018. For this reason, our focus for the next stage of arms control remains bilateral efforts with Russia.

NEW START TREATY

The New START treaty entered into force on February 5, 2011. It allows the United States to continue to field a credible and flexible nuclear deterrent force while also providing a framework for bilateral reductions in strategic nuclear weapons systems. When fully implemented, the New START treaty will result in the lowest number of deployed nuclear warheads since the 1950s. The treaty limits both the United States and the Russian Federation to 1,550 accountable warheads on deployed ICBMs, deployed SLBMs, and heavy bombers. Strategic stability will be maintained through a robust triad of strategic delivery systems under the treaty's limit of 700 deployed ICBMs, deployed SLBMs, and deployed heavy bombers and 800 total strategic delivery systems. The United States can meet national security requirements under these limits.

A key contribution of New START is its extensive verification regime. I am pleased to report that the United States has been fully implementing the measures that are included in this regime. Since entry into force, the United States and Russia have each conducted 40 onsite inspections. Each side has fully used its respective inspection quotas for the treaty's first 2 years, and both sides are well into the third year of inspections. Each side is exchanging updates to its respective databases on strategic offensive arms, twice per year as agreed under New START, and each has exchanged telemetric information on selected ICBM and SLBM launches. Delegations from the United States and Russia have also met five times under the Treaty's Bilateral Consultative Commission to address implementation issues.

The United States is on track to meet New START's central limits by the February 5, 2018 deadline. We look forward to continuing robust bilateral cooperation and dialogue with the Russian Federation as we fully implement the treaty.

FUTURE ARMS CONTROL EFFORTS WITH RUSSIA

As the 2010 Nuclear Posture Review stated, New START is the first step by this administration in lowering the numbers of nuclear weapons and delivery systems deployed by the United States and Russia. We intend to pursue further bilateral reductions and transparency with Russia that would cover all nuclear weapons—de-

ployed and non-deployed, strategic and nonstrategic—while ensuring that we maintain our commitments to stability with other nuclear powers, deterrence of potential adversaries, and assurance of our allies and partners.

Because of improved relations with Russia, strict numerical parity in nuclear weapons is no longer as compelling as it was during the Cold War. On the other hand, large disparities in nuclear capabilities could raise concerns on both sides and among U.S. allies and partners, and may not be conducive to maintaining a stable, long-term strategic relationship, particularly at lower numbers. Therefore, as the NPR stated, we will place importance on Russia joining us as we pursue additional reductions in nuclear stockpiles.

The timing and framework for the next round of negotiations are not settled, but we are working now to establish the appropriate conditions. The administration has been clear that future discussions with Russia should include non-strategic nuclear weapons, consistent with the Senate's Resolution of Advice and Consent to Ratification for New START.

NUCLEAR POSTURE REVIEW IMPLEMENTATION STUDY

The administration has been conducting an NPR implementation study to review our nuclear deterrence requirements and operational plans to ensure they address today's threats. Once the President reviews the results of the study and makes decisions regarding its recommendations, the administration will revise employment guidance and operational plans accordingly. The President's decisions regarding the study recommendations will also provide the foundation on which we can develop specific proposals regarding further nuclear reductions that we can use as the basis for discussions with Russia.

The implementation study focuses on the five key strategic objectives established in the Nuclear Posture Review:

- Preventing nuclear proliferation and nuclear terrorism;
- Reducing the role of U.S. nuclear weapons in U.S. national security strategy;
- Maintaining strategic deterrence and stability at reduced nuclear force levels;
- Strengthening regional deterrence and reassuring U.S. allies and partners; and
- Sustaining a safe, secure, and effective nuclear arsenal.

The analysis is not yet complete, but our preliminary view based on work to date, is that further reductions consistent with the national security environment will be possible and that continuing modernization of our nuclear capabilities is essential. The details of this work are highly sensitive, but as already promised by the Secretary of Defense, the Department is committed to sharing relevant aspects of the analysis with the senior leaders of the defense committees when approved by the President. The Secretary is committed to keeping Congress fully informed of policy developments and our plans for adjustments to both the nuclear force and its supporting nuclear complex.

BUDGET/UNCERTAINTIES

The current fiscal situation continues to put pressure on the entire Department of Defense. As sequestration cuts are implemented and as budgetary uncertainties continue, the Department will make difficult decisions and assume more risks. These risks, however, will not alter our prioritization of the nuclear mission and our commitment to U.S. extended deterrence and assurance of allies and partners. We will make every effort to minimize adverse effects on our mission and to ensure the capabilities and readiness of our forces.

For as long as nuclear weapons exist, the United States will maintain a safe, secure, and effective nuclear stockpile. A modern, responsive nuclear weapons infrastructure is the foundation of our nuclear deterrent and the Department of Defense, in partnership with the Department of Energy (DOE)/National Nuclear Security Administration (NNSA), will take the steps necessary to ensure its long-term sustainment and modernization. Those steps, and how the administration proposes to fund them, were originally laid out in the fiscal year 2011 "Section 1251 Report." Ongoing fiscal challenges and greater-than-anticipated program costs have forced a reexamination of the 1251 strategy and supporting programs. As a result, the administration has worked to identify cost savings in a sensible and strategic way. We will protect important modernization programs, while continuing to meet our other defense, deterrence, and assurance commitments. We have made difficult choices and are accepting risk through program delays where feasible and other programmatic adjustments.

One such adjustment has been the development of an enduring strategy for plutonium capability that includes re-use of existing plutonium pits to meet near-term requirements. This has allowed for a deferral of the Chemistry and Metallurgy Research Replacement-Nuclear Facility (CMRR–NF) that has, in turn, freed funding for construction of the Uranium Processing Facility (UPF). Design work on the UPF continues, and is scheduled for completion in mid-fiscal year 2014.

These decisions reflect careful consideration on the part of the DOE/NNSA, in close consultation with the Department of Defense, and the difficult choices that have been made in order to operate within the budget constraints imposed by the current fiscal environment. Our prioritized stockpile plan supports the President's commitment to modernizing the Nation's nuclear infrastructure and the importance of the nuclear mission.

FORCE MODERNIZATION

The 2010 NPR concluded that the United States will maintain a triad of ICBMs, SLBMs, and nuclear-capable heavy bombers; the President's fiscal year 2014 budget supports its modernization. As Secretary of Defense Hagel has stated, "providing the necessary resources for nuclear modernization of the triad should be a national priority," and that is the policy of this administration.

As we move to lower numbers under New START, sustaining the sea-based leg of our nuclear deterrent remains a vital requirement. The service life for the Trident D–5 SLBM has been extended to 2042 and construction of the first of the *Ohio*-class replacement submarines is scheduled to begin in 2021.

The administration plans to sustain the Minuteman III (MMIII) ICBM system through 2030. Solid Rocket Motor (SRM) flight tests and surveillance efforts are ongoing and by 2017 will provide better estimates for component age-out and system end-of-life timelines. Guidance system and fuse replacement are also expected to be needed prior to 2030. A 2-year Air Force Analysis of Alternatives examining options and required capabilities for a follow-on system, Ground-Based Strategic Deterrence, is projected to be complete in 2014. This will allow a program to further extend the life of the MMIII or to develop a follow-on ICBM. The ICBM Demonstration Validation Program is maturing technologies for insertion into future SRM and guidance programs. Follow-on ICBM activities will be closely coordinated and leveraged with efforts to modernize the MMIII through 2030.

A key modernization issue is sustainment of the large-diameter solid-rocket motor industrial base, pending a decision whether to produce a follow-on system. Strategic rocket motor demand has been on a steady decline for the last two decades, placing a heavy burden on Navy and Air Force resources to keep it viable. Planned investments offer the Department and our industrial partners the opportunity to right-size rocket motor production capacity for the short term while retaining critical skills for the future.

The United States will maintain two B–52H strategic bomber wings and one B–2 wing. Both bombers, however, are aging. Sustained funding and support is therefore required to ensure operational effectiveness through the remainder of their respective service lives. The President's Budget Request supports upgrades to these platforms; for example, providing the B–2 with survivable communications, a modern flight system, and upgraded defensive systems. The Department has begun a program for a new, long-range, nuclear-capable, penetrating bomber that is fully integrated with a family of systems supporting intelligence, surveillance, and reconnaissance (ISR) assets. In addition, as air-launched cruise missiles (ALCM) age, the Department is planning to compete an analysis of alternatives in May for an ALCM follow-on system called the long-range standoff (LRSO) missile. We plan to sustain the ALCM and work with DOE/NNSA to sustain the W80–1 ALCM warhead until the LRSO can be fielded.

ALLIANCE COMMITMENTS

Our commitment to the North Atlantic Treaty Organization (NATO) remains strong and continues to be a positive force in the international security environment. Last year, NATO completed a rigorous analysis of its deterrence and defense posture, formally publishing the Deterrence and Defense Posture Review (DDPR), which clearly states that nuclear weapons and missile defense are core components of NATO's overall capabilities for deterrence alongside conventional forces. To implement the principles and results of the DDPR, the Alliance also updated long-standing nuclear guidance. We also work closely with our NATO allies through the Nuclear Planning Group, which is the senior alliance body on nuclear policy and posture issues. This forum provides a critical venue for discussions among NATO allies on a broad range of nuclear policy matters, including the safety and security

of nuclear weapons and the development of common alliance positions on nuclear policy.

The special relationship between the United States and the United Kingdom remains strong. Instability in the international system caused by aggressors such as North Korea and the nuclear aspirations of Iran threaten both of our states, and these shared threats strengthen our commitment to bilateral cooperation across the nuclear domain. One way in which this cooperation is evidenced is the Common Missile Compartment program. This joint effort provides significant cost-sharing benefits to both states and helps ensure that the next generation of our respective SSBN fleets remains technically sound and strategically viable. In this era of declining defense budgets and overall fiscal uncertainty, this type of collaboration is increasingly important. We value the United Kingdom's continuous at-sea deterrent and the vital contribution it brings to our allied nuclear deterrence mission.

To support U.S. extended deterrence and assurance commitments, the Department plans to provide a nuclear capability to the Joint Strike Fighter to replace existing dual-capable aircraft (DCA) in Europe. Our plan remains to integrate nuclear delivery capability into the F–35 during Follow-on Development block upgrades of the aircraft. To allow for more maturity in the Follow-on Development program, the Air Force (in coordination with the Joint Program Office) now intends to deliver nuclear capability to the F–35 for deployment after calendar year 2024. The Air Force has plans in place to ensure there will be no gaps in our ability to meet extended deterrence commitments to our allies and partners as the F–35 DCA capability comes on-line.

We continue to engage the Republic of Korea on nuclear matters through the Extended Deterrence Policy Committee, which serves as a bilateral forum to enhance the effectiveness of extended deterrence on the Korean Peninsula. This work has taken on greater urgency in light of North Korea's continued provocative actions that have increased tensions. Our recent B–52 and B–2 missions demonstrate that we are unequivocally committed to our defense of the Republic of Korea, to deterring aggression, and to ensuring peace and stability in the region.

With our Japanese allies, we continue to participate in an ongoing Extended Deterrence Dialogue, co-chaired by the State Department, which covers nuclear and missile defense issues.

This dialogue is actively strengthening our alliance by resolving questions and providing frank discussion on a range of strategic issues. Its value lies in the trust and understanding built between partners, and the opportunity it engenders to think creatively about deterrence challenges before they arise.

NUCLEAR COMMAND, CONTROL, AND COMMUNICATIONS

The Department of Defense is committed to sustaining and improving our Nuclear Command, Control, and Communications (NC3) architecture. Over the past year, the Department has begun formulating a long-term strategy to modernize critical NC3 capabilities, while also enhancing NC3 support in regional contingencies.

The Deputy Secretary of Defense is leading this effort to ensure our NC3 system remains enduring and secure against a broad range of threats and challenges. In this context, the Department is prioritizing resources to address known capability gaps while incrementally building toward a modern NC3 architecture that will ensure timely decision-making support for the President and address the full spectrum of 21st century deterrence challenges.

CONCLUSION

The current fiscal environment and ongoing budget uncertainties will continue to pose significant challenges as we move forward in the sustainment and modernization of our nuclear deterrent. As a result, we will continue to adjust programs in order to meet the Nation's deterrence and defense requirements while taking into account a declining Department of Defense budget. Despite this uncertainty, the administration remains firmly committed to safe, secure, and effective nuclear stockpile and modernized platforms to deter potential adversaries and reassure our allies and partners around the world.

STATEMENT OF LT. GEN. JAMES M. KOWALSKI, USAF, COMMANDER, AIR FORCE GLOBAL STRIKE COMMAND

General KOWALSKI. Senator Fischer, the 2-plus years really encompasses two studies. The first was what we often called the pre-analysis of alternatives or capabilities-based assessment. During

that assessment you survey the entire universe of possibilities for a follow-on weapons system and then you scope it down so that you have a reasonably sized number of alternatives to look at as you go into the analysis of alternatives (AoA).

So that was completed. It was signed out by the Chief of Staff of the Air Force back in October 2012, and then we went into the AoA. We had some bureaucratic delays as the study plan went back and forth. The study is about to begin. It will take about a year and it will report out next year.

But we've put a lot of work into this and we're comfortable that we have a very sound and structured plan to go forward with this analysis and truly look at all of the possible alternatives out there, and to weigh all the different attributes that we think we'll need as we think about this weapons system beyond 2030.

[The prepared statement of Lieutenant General Kowalski follows:]

PREPARED STATEMENT BY LT. GEN. JAMES M. KOWALSKI, USAF

INTRODUCTION

Chairman Udall, Ranking Member Sessions, and distinguished members of the subcommittee; thank you for allowing me to represent nearly 25,000 Air Force Global Strike Command (AFGSC) airmen and civilians and to appear before you for the third time as their commander. I will use this opportunity to update you on our mission, the status of our forces, and the challenges we will face over the next few years.

AIR FORCE GLOBAL STRIKE COMMAND MISSION

Since the standup of AFGSC in 2009, our mission has been to: "Develop and provide combat-ready forces for nuclear deterrence and global strike operations—Safe, Secure, and Effective—to support the President of the United States and combatant commanders."

AFGSC Nuclear Mission

At the core of our mission statement are three reinforcing attributes: "Safe-Secure-Effective." These were outlined in President Obama's 2009 Prague speech where he said: "Make no mistake: as long as these weapons exist, the United States will maintain a safe, secure, and effective arsenal to deter any adversary, and guarantee that defense to our allies." The attributes of "safe, secure, effective" serve as the foundation of every nuclear-related activity in AFGSC, from the discipline shown in the smallest task, to how we prioritize our planning and programming for the Future Years Defense Program. The effects of our nuclear force, as outlined in the 2010 Nuclear Posture Review, are to ensure strategic stability, to support the regional deterrence architecture, and to assure our allies and partners.

AFGSC Conventional Mission

Our conventional bomber forces defend our national interests by deterring, or should deterrence fail, defeating an adversary. Two capabilities are fundamental to the success of our bomber force: first is our ability to hold heavily defended targets at risk, and second is our ability to apply relentless and persistent combat power across the spectrum of conflict. The U.S. force of penetrating and stand-off heavy bombers, with their capacity for long-range and long-endurance while carrying large and varied payloads, are well-matched to our Nation's global responsibilities and are in high demand by the regional combatant commanders.

AIR FORCE GLOBAL STRIKE COMMAND FORCES

The two Numbered Air Forces under AFGSC, 8th Air Force and 20th Air Force, have a storied history back to the Army Air Corps. Eighth Air Force operations in Europe during World War II paved the way for victory over Nazi Germany. Twentieth Air Force ended the war in the Pacific by dropping atomic bombs on Hiroshima and Nagasaki. Today, these organizations continue to serve critical national security roles as Component Numbered Air Forces for U.S. Strategic Command (STRATCOM) and as Task Forces for on-alert nuclear forces.

Twentieth Air Force

Twentieth Air Force commands the Minuteman III (MMIII) intercontinental ballistic missile (ICBM) fleet and our UH–1N helicopter force. Within the Triad, our 450 dispersed and hardened missile silos provide the foundation for strategic stability with other major nuclear powers by presenting any potential adversary a near insurmountable obstacle should they consider an attack on the United States. No adversary can credibly threaten an attack on this force without depleting their own arsenal.

Minuteman III

We continue to execute our long-range plan of modernization and sustainment for the MMIII. This plan includes a new booster, Transporter Erector vehicle and reentry system Payload Transport vehicle.

The ICBM Cryptography Upgrade, Code System Media, and the Strategic Targeting and Application Computer System programs have been fully funded, providing for hardware and software upgrades to allow the secure transmission of critical codes and targeting data via modern media. These upgrades will reduce security risks and the number of manhours needed for the annual cryptographic code change at our Launch Facilities and Launch Control Centers.

We are also upgrading ICBM Launch Control Centers with advanced extremely high frequency communications. This program provides connectivity with the National Command Authority. This past year we advanced the Minuteman Minimum Essential Emergency Communications Network Program, which upgrades and modernizes cryptographic devices and enhances and secures the Emergency Action Message network. We began weapon system testing in April 2012 and fielding is scheduled to begin June 2013 in simulators before being installed in operational ICBM sites in February 2014.

In coordination with Air Force Materiel Command and the Air Force Nuclear Weapons Center, AFGSC resolved test range safety issues with ICBM flight test components to restore operational test launches after a 10-month delay. In 2012, the ICBM test community executed two operational test launches and multiple simulated and smaller scale tests. Operational testing is currently funded through fiscal year 2015 with four operational test launches scheduled per year to satisfy test requirements outlined by STRATCOM and the National Nuclear Security Administration.

We continue to closely examine emerging needs including propulsion, guidance system upgrades and fuze refurbishment to ensure MMIII weapon system remains reliable and ready through 2030. We will transition these technologies to the Ground-Based Strategic Deterrent.

Ground-Based Strategic Deterrent

The MMIII, fielded in the 1970s with a planned service life of 10 years, has proven its value in deterrence well beyond the platform's intended lifespan. The Ground-Based Strategic Deterrent (GBSD) is the program intended to replace the MMIII and we will start the Analysis of Alternatives (AoA) this July. Initial capabilities were identified, validated by the Joint Requirements Oversight Council, and approved in August 2012 by the Air Force Chief of Staff. The analysis is critical to inform near-term recapitalization programs so technologies and components can be leveraged into GBSD approaches. Completion of the GBSD AoA is projected for late fiscal year 2014. Navy representatives are fully engaged with our GBSD team, investigating the benefits and risks of commonality, with the objective to reduce future design, development, and manufacturing costs for strategic systems.

UH–1N

AFGSC is the lead command for USAF UH–1N in support of two critical national missions: nuclear security for AFGSC and Continuity of Operations/Continuity of Government taskings for the Air Force District of Washington.

Although the UH–1Ns are over 40-years old, we expect to fly them for at least another decade. We must sustain the helicopter's current capabilities and selectively modernize them to minimize existing capability gaps and avoid increased sustainment costs brought on by obsolescence. These efforts include installing crashworthy seats, making the cockpit fully night vision compatible, replacing obsolete sensors to better support our security mission and the National Search and Rescue Plan, and performing some delayed safety and sustainment improvements. We will continue to look, both inside the Air Force and across the Department of Defense, for ways to reduce risk with the current fleet and close our capability gap. Moreover, the UH–1N's deficiencies in range, speed, and payload can only be remedied through

replacement with a new platform. Our way ahead for UH–1N replacement is the Common Support Helicopter program, which is currently unfunded.

Eighth Air Force

Eighth Air Force commands the B–2 Spirit and B–52H Stratofortress bomber forces and directs the bombers' conventional and nuclear operational readiness. The B–2 gives the United States the ability to attack heavily defended targets, while the B–52H serves as the premier high-altitude standoff bomber. Our dual-role bomber fleet is the most visible leg of the nuclear triad, allowing decisionmakers to demonstrate resolve through generation, dispersal or deployment.

B–52H

Our emphasis on 2012 as the "Year of the B–52" highlighted the bomber's storied 60-year operational history and the airmen who have worked tirelessly to keep the aircraft flying. The B–52 is able to deliver the widest variety of standoff, direct attack, nuclear and conventional weapons in the Air Force, and remains a universally recognized symbol of American airpower.

AFGSC continues to pursue funding to complete the Combat Network Communications Technology (CONECT) upgrade. This upgrade resolves sustainability issues with aging cockpit displays and communications while also providing a "digital backbone" to take the B–52 past 2040 and allow integration into the complex battlespace of the future. CONECT replaces aging displays, adds a radio, provides beyond line-of-sight communications and situational awareness, efficient machine-to-machine retargeting, and connectivity to the net-centric command and control environment. The CONECT program successfully passed Milestone C and stands ready for your continued support.

The B–52 gets additional combat capability through fielding of the Miniature Air Launched Decoy (MALD). The B–52 and F–16 are currently the only aircraft to use this decoy. Additionally, AFGSC is programming for an internal weapons bay modification which will increase payload by 66 percent for advanced precision weapons such as MALDs, Joint Direct Attack Munitions, and Joint Air-to-Surface Standoff Missiles.

We have a number of ongoing sustainment efforts underway, to include a replacement landing gear anti-skid controller, the upgraded Forward-Looking Infrared Sensor and a wiring replacement program.

Additionally, AFGSC continues to pursue a safe, secure, and effective nuclear arsenal on the B–52 with the Service Life Extension Program for the Air Launched Cruise Missile (ALCM). The intent is to extend the ALCM through 2030 until the Long-Range Standoff Missile (LRSO) becomes operational.

Finally, we executed all fiscal year 2012 scheduled Nuclear Weapons System Evaluation Program testing requirements by launching six B–52H ALCMs and executing nine B–2 gravity bomb missions with 100 percent reliability. Overall, the B–52's ALCM weapon system reliability increased by over 10 percent and it remains a strong and capable nuclear deterrent.

B–2

2013 kicks off our "Year of the B–2" to celebrate the 20-year anniversary of the first B–2 delivery to the USAF. During this year, we will focus on the weapon system's sustainment, readiness, and especially the airmen who keep this stealthy bomber flying.

In the fiscal year 2014 budget, we advocated for full funding of the B–2 Defensive Management System upgrade. This avionics improvement enhances aircrew situational awareness and increases aircraft survivability in heavily defended airspace against modern 21st century integrated air defense systems.

We installed the B–2 Extremely High Frequency Increment 1 upgrade on the first two operational aircraft. This modification improves onboard computers and provides a fiber optic backbone enabling future programs. Operational testing of these aircraft was completed this year and we are nearing full nuclear certification of the modified systems. We are on track to complete installation on the remaining aircraft by 2016, 4 months ahead of schedule.

AFGSC continues to evolve B–2 conventional combat capability by fielding vital programs such as the Massive Ordinance Penetrator (MOP). Our Nation's ability to hold hardened, deeply buried targets at risk was bolstered by successful testing and fielding of the MOP, and this 30,000-pound weapon is now operational. This year we also tested a new B–2 low observable field modification which cuts maintenance by about 10,000 hours per year and we are on track to complete this installation 3 years ahead of schedule. Finally, we completed the $1.4 billion B–2 Radar Modernization Program, ensuring full compliance with the Federal Communications

Commission mandates while maintaining the B–2's ability to navigate and target its weapons.

The B–2 enterprise strives to maintain the proper balance of fleet modernization efforts, test, aircrew training, and combat readiness. The dynamics of a small fleet continue to challenge our sustainment efforts primarily due to vanishing vendors and diminishing sources of supply. Air Force Materiel Command is working to ensure timely parts availability; however, many manufactures do not see a strong business case in supplying parts for a small aircraft fleet. Problems with a single part can have a significant readiness impact on a small fleet that lacks the flexibility of a large force to absorb parts shortages and logistics delays.

Fleet-wide Bomber Initiatives

We executed the command's 2012 $471 million flying-hour program resulting in 91 percent training currency for all assigned aircrews. One of our major command initiatives involved implementing a fleet-wide aviation fuel efficiency and tracking program. This provided guidance on a number of fiscal year 2012 fuel conservation measures, resulting in a total of $7.8 million in fuel savings, far surpassing our original goal of $3 million. AFGSC also matured the bomber tasking process via Global Force Management.

Long-Range Strike Bomber

The combat edge our innovative B–2 provides will be challenged by next generation air defenses and the proliferation of these advanced systems. The Long-Range Strike Bomber (LRS–B) program works to extend American air dominance against advanced air defense environments. We continue to work with Air Combat Command to develop the LRS–B and field a fleet of 100 new dual-capable bombers beginning in the mid-2020s.

Long-Range Standoff Missile

In a similar manner to LRS–B, the LRSO aids in our mission to assure and deter. The LRSO will be the follow-on to the aging ALCM and will be compatible with the B–52, B–2, and LRS–B. The Analysis of Alternatives is complete and undergoing staffing through the joint community. We have worked closely with the LRSO Program Office to develop an acquisition strategy aligned with the Department of Energy's process for selecting and adapting an existing warhead.

B–61

The B61–12 program will extend the life of the B–61 and, with the B61–12 Tailkit Assembly program, will give us a safe, secure, and effective nuclear bomb for our dual-capable bombers and fighters. The Tailkit program vendor selection has been accomplished and the program is entering into Engineering and Manufacturing Development. This joint AFGSC/Department of Energy endeavor will allow us to continue to meet our strategic requirements and regional commitments.

SECURITY

Nuclear surety and security are at the forefront of the command's mission. To keep our focus on these challenges, we developed a Strategic Security Plan (SSP) as an integrated road map for our security initiatives. The SSP will improve our nuclear security by incorporating lessons learned from other government agencies and recent overseas contingency operations.

A major AFGSC initiative is designing new Weapon Storage Facilities to consolidate nuclear maintenance, inspection, and storage. These will replace deficient and worn buildings in our aging weapon storage areas with a single modern and secure facility. This initiative eliminates security, design, and safety deficiencies and improves our maintenance processes.

Following partial design, the project will undergo validation by external agencies to include the Defense Threat Reduction Agency, Air Force Nuclear Weapons Center, Air Force Safety Center, and Air Force Security Center. We are also seeking Department of Energy and U.S. Navy input to explore ways to standardize across all organizations. Final design completion is scheduled for March 2014. Our goal is to begin to include the MILCON for these new weapon storage facilities in fiscal year 2015.

The Air Force's toughest inspection schedule continues to assess compliance and combat readiness in both our nuclear and conventional missions. Last year, we reported on our initiative to consolidate inspections to free up more training time for our airmen and units. We implemented the first round of Consolidated Unit Inspections in 2012, bringing evaluators from multiple AF agencies into a single inspection. Additionally, we reduced overlap between the Nuclear Surety Inspections and

Nuclear Operational Readiness Inspections without compromising individual inspection requirements. Combined, these initiatives returned an average of 132 operational training days per 3-year inspection cycle to each of our six wings while maintaining the high standards demanded of nuclear operations.

We continue our efforts to improve and strengthen the nuclear enterprise through our long-range planning efforts. AFGSC initiated an enterprise-wide campaign to develop a 20-year comprehensive investment strategy for the Air Force's Nuclear Deterrence Operations core function. We will use this plan to bolster our ability to provide the President and combatant commanders vital global strike warfighting capabilities by prioritizing modernization, sustainment, and acquisition efforts for our bomber, ICBM, and helicopter weapon systems and the nuclear command, control, and communications systems that underpin them all.

Nuclear Command, Control, and Communications (NC3)

Assured NC3 connectivity is the linchpin to a credible and secure strategic deterrent. As the Air Force Nuclear Command and Control System Chief Architect, the AFGSC Director of Communications is leading the Air Force prioritization and investment in survivable NC3. Within AFGSC, these systems include the Family of Advanced Beyond-line-of-sight Terminals, the Common Very Low Frequency Receiver, and upgrades to our wing command posts, Mobile Support Teams, and ICBM Launch Control Centers.

2013 FOCUS AREAS

Always Better

The special trust and responsibility we have for nuclear weapons demands a culture where we must always seek to be better. Although we will continue to be challenged with sustaining aging weapon systems, we will leverage the innovation of our airmen to get the most out of our resources.

Win the Fight

Whether that fight is in overseas contingencies where we have 1,100 airmen deployed, or with our nuclear deterrent forces on alert today and every day, we will push to keep both our nuclear and conventional forces as combat ready as possible.

Care for Our Team

We will improve the quality of life for our airmen and their families, aware of the unique demands of our mission and our locations. We will continue to foster resiliency and strength within a wingman culture, and we will aggressively educate and train our people with regard to the problem of sexual assault. Furthermore, we will continue to build a culture around our command value of "Respect for the worth and dignity of every airman."

Modernize

We will stay focused on our weapon system modernization initiatives. Our MMIII has to be sustained to 2030 and we will advocate for a follow-on based on our GBSD work. The B–52H will take us past 2040 as the stand-off platform of choice, with a robust payload, unsurpassed range, and the greatest variety of munitions in the inventory. The B–2 will be our strategic penetrating platform denying safe haven to any adversary. The Long-Range Strike Bomber will make sure we can continue to hold the global target set at risk. As our Air Launched Cruise Missile becomes obsolete and unsupportable, we will field a credible and flexible nuclear deterrent with the stealthy Long-Range Standoff missile and consider conventional variants.

CONCLUSION

Thank you for your continued support of AFGSC. Our enduring challenges in AFGSC are: First, to instill a culture where every airman understands the special trust and responsibility of nuclear weapons. Second, to maintain excellence in our conventional forces. Third, to sustain the current force while modernizing for the future.

Fiscal constraints, while posing planning challenges, do not alter the national security landscape or the intent of competitors and adversaries. Nor do they diminish the enduring value of long range, "strategic" forces to our Nation. Although we have less than 1 percent of the DOD budget, AFGSC nuclear forces help provide the ultimate guarantee of national sovereignty and AFGSC conventional forces provide joint commanders rapid global combat airpower.

It is my distinct privilege to lead this elite team and we assure you and this committee that AFGSC, working with our joint partners, will meet these challenges and

provide our Nation with ready forces for nuclear deterrence and global strike operations—safe, secure, and effective.

Senator FISCHER. Do you anticipate then that 2014 will be the completion date?

General KOWALSKI. Yes, Senator.

Senator UDALL. Thank you.

Then for the entire panel, I would like to address the triad. Air Force Secretary Donley has stated that as our nuclear forces get smaller, "It's all the more important that we maintain a balanced triad." General Kehler, who I have had the honor to meet and visit with, has repeated similar statements about the need to maintain all three legs of our nuclear triad.

Could each of you give me your quick opinion: Do you think that the triad is still the best configuration that we have for our nuclear forces, and do you see any reason, or would you ever that you can foresee suggest that we should abandon the triad that we have? Madam Secretary, if we could start with you, please.

Ms. CREEDON. Thank you. The Nuclear Posture Review (NPR) made clear that it is the position of the administration to maintain the triad. That continues to be the position of the administration and even, although we've not completed the study on new presidential guidance, nevertheless maintaining the triad is also an element of that study.

Senator FISCHER. Thank you.

STATEMENT OF HON. ANDREW C. WEBER, ASSISTANT SECRETARY OF DEFENSE FOR NUCLEAR, CHEMICAL, AND BIOLOGICAL DEFENSE PROGRAMS

Mr. WEBER. Yes. I would just add, Senator, that last year under the auspices of the Nuclear Weapons Council (NWC) we developed a 25-year strategy that aligns our warhead plans as well as our platform and delivery system plans. That strategy, known as the 3 Plus 2 Strategy, which was briefed to the Senate last year, very much maintains our triad as part of our safe, secure, and effective deterrent.

[The prepared statement of Mr. Weber follows:]

PREPARED STATEMENT BY HON. ANDREW C. WEBER

INTRODUCTION

Chairman Udall, Ranking Member Sessions, and members of the subcommittee, thank you for giving me the opportunity to testify regarding U.S. nuclear forces. It gives me great pleasure to join Assistant Secretary of Defense Creedon, General Kowalski, General Harencak, and Admiral Benedict to discuss these vital topics.

I have the privilege of serving as the Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs (NCB), as well as the Nuclear Weapons Council (NWC) Staff Director. In this capacity, I am the principal advisor to the Secretary of Defense, Deputy Secretary of Defense, and the Under Secretary of Defense for Acquisition, Technology and Logistics (AT&L) for nuclear matters. AT&L plays a key role in managing the U.S. nuclear deterrent and leading the Department's efforts to acquire the strategic delivery systems for nuclear weapons in order to meet the operational needs of our Armed Forces. Chief among my responsibilities are the missions of providing the United States and its allies with a safe, secure, and effective nuclear deterrent capability and ensuring the nuclear-survivability of U.S. military forces and the Department of Defense (DOD) infrastructure.

Today's testimony will focus on DOD's work with the Department of Energy (DOE)/National Nuclear Security Administration (NNSA), particularly over the past year, to ensure that the United States continues to maintain a safe, secure, and ef-

fective nuclear deterrent. The partnership between the Departments is marked by extensive collaboration and a shared commitment to the Nation's security. To ensure that the success of this relationship continues, it is essential that Congress supports the President's fiscal year 2014 budget request for nuclear weapons activities executed by DOD and NNSA. This request includes funds to ensure a safe and effective stockpile, to modernize the nuclear infrastructure, and to upgrade ballistic missile and bomber delivery systems. Today, I would like to share with you the progress the NWC has made in ensuring our two Departments achieve its goals and our approach to accomplishing these objectives in the coming year.

Today's fiscal uncertainty presents greater challenge to the talented and unique personnel who support the mission of ensuring a safe, secure, and effective nuclear deterrent. The challenges facing our aging complex continue to demand a highly skilled workforce. Civilian hiring restrictions, salary freezes, and possible unpaid furloughs and their effects on our readiness are some of my gravest concerns.

Over the past year, the NWC met frequently to focus attention on the most pressing challenges faced by the nuclear weapons enterprise. These challenges include managing life extension of warheads in the U.S. nuclear stockpile, modernization of the nuclear infrastructure that supports the stockpile, and modernization of DOD's nuclear delivery platforms.

Additional challenges remain. For example, section 3166 of the National Defense Authorization Act for Fiscal Year 2013 establishes a congressional advisory panel on governance of the nuclear weapons enterprise. Its purpose is to explore options to strengthen governance and thereby ensure that national security needs are being effectively and efficiently met. The DOD looks forward to the panel's recommendations and to follow-on dialogue on this important issue.

Sufficient and timely funding for the enterprise remains a critical challenge for the NWC. The Council has worked hard to align resources, plans, and requirements. The NWC performed extensive cost assessments and leveraged other programmatic expertise to ensure the NNSA and DOD budget request reflects the most urgent priorities of the nuclear weapons enterprise. This exercise reflects a much greater level of collaboration between the two Departments and an updated review of the many demands our aging enterprise requires.

A PATH FORWARD FOR A NEW U.S. NUCLEAR POSTURE

Reversing decades of neglect and addressing the aging nuclear enterprise continues to be a priority for the NWC. We must ensure that the infrastructure, capabilities, and critical skills needed to support the nuclear deterrent are maintained over the long term. The NWC has created a long-term strategy to meet our Nation's future deterrence needs that better aligns the components of the enterprise so that our warfighter is served and our taxpayer is protected. The work of the Council has identified the enterprise's most pressing priorities and addressed means to ensure that both DOD and DOE were prepared to execute these critical modernization programs. The timing of multiple life extension programs, competing requirements, higher-than-anticipated program costs, and a constrained fiscal environment required the NWC to make difficult decisions over the past year.

MAINTAINING FISCAL PRUDENCY AND REVITALIZING THE NUCLEAR INFRASTRUCTURE

An effective strategic deterrent consists of more than nuclear weapons and their delivery platforms. It also requires an infrastructure to provide agile research and development and manufacturing capabilities. A responsive infrastructure will provide the United States with capabilities to address technical problems in the stockpile, or future adverse geopolitical challenges, with a substantially smaller stockpile than today's. Recapitalizing the Nation's nuclear infrastructure will require significant investments. The Departments of Defense and Energy share a common path forward to accomplish this task in a responsible, fiscally prudent manner.

Over the last year, the DOD Office of Cost Assessment and Program Evaluation (CAPE) and NNSA collaborated on a joint review of DOD's nuclear weapons requirements and funding options, involving potential increased efficiencies, to meet those requirements. This holistic look enabled the NWC to adjust requirements and prioritize spending, and further enhanced the partnership between DOD and DOE/NNSA, as well as the NWC's ability to certify annually the NNSA budget.

Our fiscal year 2014 budget request supports essential DOD priorities: research and development to support the *Ohio*-class replacement submarine; life extension of the Trident II D5 missile; sustainment of Minuteman III activities; upgrades to the B–2 and B–52H heavy bombers; and completion of the Analysis of Alternatives for a Long-Range Standoff missile to replace the current air-launched cruise missile. Additionally, DOD plans to develop a new penetrating bomber and dual-capable air-

craft with the F–35 Joint Strike Fighter. Finally, DOD is modernizing the command and control network that detects and characterizes an attack and links nuclear delivery systems to Presidential authority.

To address the aging weapons infrastructure, the NWC is advancing its plutonium strategy including options to replace the aging, unsupportable Chemistry and Metallurgy Research facility that currently provides plutonium capabilities.

After careful consideration of requirements, competing priorities, and existing capabilities, the administration decided to defer construction of the Chemistry and Metallurgy Research Replacement-Nuclear Facility (CMRR–NF) by at least 5 years. This deferral allowed us to address competing demands such as construction of the Uranium Processing Facility at Y–12, which now has a sufficient funding profile, resulting in reduced life cycle cost and reduced risk to ongoing highly-enriched uranium operations at antiquated existing facilities. It also provided flexibility to address critical warhead Life Extension Programs (LEP) for the W76–1, the B61–12 bomb, and the W78/88–1 interoperable warhead.

We recognize that an enduring pit production capacity is needed not only to support current and future LEPs, but also, as pointed out earlier, to provide an ability to respond to technical failure in the stockpile or geopolitical reversals. To manage the risk of deferral, we must develop means, in the near term, to respond more rapidly to technical or geopolitical challenges pending the coming on line of planned enduring production capacity. The NWC approach to managing this risk includes a resourced plan to utilize pit reuse in ongoing LEPs while growing the manufacturing capacity we have today to 10 pits per year by 2019, 20 pits per year by 2020, and 30 pits per year by 2021. All of this is contingent upon the sustainment of today's capabilities for analytical chemistry and other processes in support of pit production. It is also contingent on congressional approval of NNSA's fiscal year 2012 $120 million reprogramming request to provide funds to carry out these activities.

To ensure the Nation maintains an enduring plutonium capability, NNSA is working with the NWC to advance a strategy to support both near- and long-term stockpile requirements. We are exploring a concept that would provide the essential capabilities planned for CMRR with a phased, more responsive, and more readily implementable approach. This approach will also provide opportunities to address aging issues associated with LANL's PF–4 pit manufacturing facility.

Initial concept review suggests a new, modular concept could serve the warfighter's needs in a way that best protects the taxpayer. We need to conduct more analysis. Over the next 2 months, the NWC, with support from DOD's CAPE organization, will work with Los Alamos to carry out a comparative analysis of the concept; address risks and benefits, pros and cons; and gain some initial insights into feasibility of delivery of key capabilities earlier than planned for CMRR–NF. If the concept is assessed to be feasible, and with congressional support, NNSA will develop its plan to move forward on engineering development and construction for this new, modular approach. We remain committed to a modern responsive nuclear weapons infrastructure that recognizes the new fiscal realities we now face and look forward to congressional engagement on our activities.

As with any major systems acquisition program, building large, one-of-a-kind nuclear facilities presents significant challenges in terms of planning, design, and development—one of our principal requirements in today's fiscally constrained environment is to control costs.

DOD STOCKPILE REQUIREMENTS

Looking to the future of the nuclear arsenal, DOD and NNSA are moving forward with several weapon system LEPs in fiscal year 2014 to support long-term deterrent capabilities. The B61–12 and W76–1 LEPs are the most critical LEPs to our stockpile, and NNSA will continue funding these LEPs in fiscal year 2014. Given fiscal challenges, the NWC agreed that slipping the W78/88–1 interoperable warhead and W88 alteration created manageable risk while allowing resources to continue to support the B61–12 and W76–1 LEPs. These decisions allow us to meet Air Force and Navy requirements while more efficiently managing annual costs among our various programs.

In 2012 DOD and NNSA entered into Phase 6.2, Feasibility Study and Option Down-select, for the W78/W88–1 interoperable warhead study to examine a warhead option that could be deployed with both intercontinental ballistic missiles (ICBMs) and submarine-launched ballistic missiles (SLBMs). To leverage this effort, DOE, the Air Force, and the Navy are teaming to develop a modern Arming, Fuzing and Firing (AF&F) system, initially for the W87 ICBM warhead, but adaptable for use in a W78/W88–1 interoperable warhead. Efforts to develop an interoperable warhead for deployment on multiple platforms would allow the DOD to reduce the num-

ber of warhead types and the number of Reserve warheads needed to hedge against unforeseen technical or geopolitical contingencies. When fielded, the W78/W88–1 LEP interoperable warhead will provide opportunity for further reductions in Reserve warheads. Warhead interoperability would also allow for substantial reductions in life-cycle and production costs. The Secretaries of the Air Force and Navy, and the NWC will provide statements and assessments of these plans to Congress pursuant to section 1044 of theNational Defense Authorization Act for Fiscal Year 2013.

For the bomber leg of the Triad, DOD requires life extension of the B61 gravity bomb. The B61 mod 3/4 non-strategic bombs are deployed with NATO dual capable aircraft to provide U.S. extended deterrence to our allies. The B61–7/11 strategic bombs are carried by the B–2 bomber and are an essential component of air-delivered strategic deterrence. In April 2010, the Nuclear Posture Review reaffirmed both the extended and strategic deterrent roles of the B61 and directed proceeding with its full-scope life extension. The result will be a single bomb, termed the B61 mod 12, which will replace four types of the B61—one strategic and three non-strategic—further promoting efficiencies and minimizing costs.

The B61–12 is currently in Phase 6.3, Development Engineering and is on schedule for this year's milestones. We have worked successfully to ensure that the development of DOD-provided hardware, in this case, a tail kit, is on track to meet LEP requirements. The Air Force has funded both the tail kit development and production to synchronize with NNSA needs as well as the cost of integration of the B61–12 digital electronics into the B–2 Bomber. The overall LEP schedule has been revised for DOE/NNSA to complete the first production unit by no later than the end of fiscal year 2019. Meeting this date for the first production unit is essential to meeting U.S. Strategic Command's requirements and also critical in meeting U.S. commitments to our NATO allies to sustain their non-strategic nuclear capabilities and to provide extended deterrence. As the effects of sequestration unfold, the NWC will carefully monitor potential impacts to the B61–12 and mitigate risk to our extended deterrence commitments. We are acutely aware of the burgeoning costs of the B61–12 LEP; increased management attention is essential to controlling these costs.

In addition to our efforts to revitalize weapons, delivery systems and facilities, we continue efforts to enhance physical security in the nuclear enterprise. The July 2012 protestor incursion at the Y–12 facility highlighted the need for continued collaborative efforts to address physical security challenges within both DOE and DOD. Most notably, in the 2011 U.S. Nuclear Physical Security Collaboration Memorandum, we formalized collaboration between DOD and DOE and agreed to common protection standards for nuclear weapons and materials.

EFFORTS TO COUNTER NUCLEAR THREATS

Finally, I want to highlight DOD's efforts to counter nuclear threats, including those efforts that help ensure that terrorists and proliferators cannot access nuclear materials and expertise abroad. Since September 11, 2001, there has been valuable collaboration on this goal at the Federal level. President Obama has called nuclear weapons in the hands of terrorists "the single biggest threat to U.S. security." As President Obama pointed out, just one nuclear weapon detonated in an American city would devastate "our very way of life" and represent a "catastrophe for the world." For this reason, this administration has outlined a series of policies that reflect the gravity of this threat, and the interagency has made significant improvements in working to prevent, and preparing mitigation actions for, catastrophic nuclear events.

One of DOD's priorities is to truly "internationalize" the response to the nuclear terrorism threat. The United States has been aggressive in its threat reduction efforts, but it cannot meet this challenge alone. In President Obama's view, there is a pressing need to "deepen our cooperation and to strengthen the institutions and partnerships that help prevent nuclear materials from ever falling into the hands of terrorists." To this end, we are expanding nuclear counterterrorism and threat reduction cooperation with two of our closest allies, the United Kingdom and France, building on all three countries' technical expertise and history of cooperation. At the 2012 Nuclear Security Summit, the three governments released a joint statement pledging cooperation and assistance to others facing nuclear terrorism threats. However, this work cannot be limited to a handful of countries. For this reason, we have made building international partnership capacity a high priority.

Next year, the third Nuclear Security Summit will be held in the Hague, Netherlands. This gathering brings together heads of state and international organizations to address measures to combat the threat of nuclear terrorism, protect nuclear ma-

terials, and prevent the illicit trafficking of nuclear materials. First introduced by President Obama in Prague in 2009, the Summit process formally began in Washington, DC, in 2010 and endorsed the President's call for an international effort to secure all vulnerable fissionable materials worldwide. The United Stateshas contributed to this global effort through an interagency strategy to eliminate as much material as practicable and ensure that all remaining sites are secured at least to the guidelines set forth by the International Atomic Energy Agency. DOD has supported this effort by working to secure weapons-usable nuclear material in Russia and Kazakhstan and is expanding its efforts to collaborate with Japan, China, India through their planned nuclear security training centers. Ensuring that all nuclear material remains secure remains the first priority, but there are also critical efforts underway to address the risks of lost or stolen nuclear material and build capacity for responding to incidents involving nuclear material. DOD contributes to these activities by building partner capacity in detection, interdiction, border security and emergency response. While the focused 4-year effort concludes at the end of calendar year 2013, nuclear security is an enduring responsibility as long as nuclear materials exist. To this end, DOD is exploring the potential for establishing national-level systems for nuclear material tracking. These systems would be designed to monitor and track nuclear material in use, storage and transit across all the nuclear facilities within a country's borders. In addition to providing assurance that nuclear material remains secure and in authorized locations, such systems would improve capability to counter insider threats and sustain nuclear security efforts over the long-term. NCB oversees the implementation of DOD's efforts in support of the President's nuclear security agenda.

On the domestic front, the Nuclear Weapons Accident Program focuses on developing the capabilities required to mitigate the consequences of a U.S. nuclear weapon accident or incident. This full-scale national-level exercise program is shared among the Air Force, Navy, and DOE/NNSA and addresses non-terrorist driven events in addition to those not caused by malevolent actions. We look forward to ongoing collaboration in future exercises and to continued progress in preparing for potentially catastrophic events.

CONCLUSION

The nuclear threat to the United States has evolved considerably since the end of the Cold War. No longer does the threat of a large-scale nuclear exchange hover constantly over the world. Yet, we cannot afford to be complacent. We must continue to field a strong nuclear deterrent that is supported by an agile and responsive infrastructure and we must continue to carry out the threat reduction and nonproliferation activities that help to manage nuclear terrorist threats. DOD remains committed to its vital partnership with DOE in meeting the Nation's most fundamental security needs. In closing, I respectfully ask for your support for the President's fiscal year 2014 budget request. This will ensure that we are fully capable of providing safety and security to the American people.

Senator FISCHER. Thank you.

General KOWALSKI. Senator, the triad is complementary. It's not redundant. When you look at the risks to our nuclear force, the three major risks that were outlined in the NPR were: first, the risk of a technological disruption; second, a risk of a technical failure with one leg of the triad; and third, a risk of geopolitical breakout or change in the world.

When you evaluate all of those risks and then you look at the legs of the triad that we have today, that's a good balance and a good mix and a relatively inexpensive way to provide that sense of the ultimate guarantee of national sovereignty.

Senator FISCHER. Thank you.

STATEMENT OF RADM TERRY J. BENEDICT, USN, DIRECTOR, STRATEGIC SYSTEMS PROGRAMS

Admiral BENEDICT. Senator, I fully support the concept of a triad and I foresee no issues that would change that status in the future.

[The prepared statement of Rear Admiral Benedict follows:]

PREPARED STATEMENT BY RADM TERRY J. BENEDICT, USN

INTRODUCTION

Chairman Udall, Ranking Member 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 ensure the safety of our Navy's sea-based strategic deterrent, the Trident II (D5) Strategic Weapon System (SWS). 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.

The Navy provides the most survivable leg of the U.S. nuclear triad with our ballistic missile submarines (SSBNs) and the Trident II (D5) SWS. A number of factors have contributed to an increased reliance on the sea-based leg of the triad. The 2010 Nuclear Posture Review reinforced the importance of the SSBNs and the SLBMs they carry. SLBMs will comprise a majority of the Nation's operationally deployed nuclear warheads, thus increasing the Nation's reliance on the sea-based leg.

Ensuring the sustainment of the sea-based strategic deterrent capability is a vital, national requirement today and into the foreseeable future. Our budget request provides the required funding in fiscal year 2014 for the Trident II (D5) SWS. To sustain this capability, I am focusing on five priorities: Nuclear Weapons Safety and Security; the Trident II (D5) SWS Life Extension Program; the *Ohio* Replacement Program; the Solid Rocket Motor (SRM) Industrial Base; and Collaboration with the Air Force. Today, I would like to discuss my five priorities and why these priorities are key to the sustainment of the Navy's sea-based strategic deterrent and its future viability.

NUCLEAR WEAPONS SAFETY AND SECURITY

The first priority I would like to address, and the most important, 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.

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 and Waterfront Restricted Areas 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 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. My command maintains a culture of self-assessment in order to sustain safety and security. We continue to focus on the custody and accountability of the nuclear assets that have been entrusted to the Navy. SSP's number one priority is to maintain a safe, secure, and effective strategic deterrent.

D5 LIFE EXTENSION PROGRAM

The next priority I would like to discuss is SSP's life extension efforts to ensure a future, effective and reliable sea-based deterrent. The Trident II (D5) SWS continues to demonstrate itself as a credible deterrent and exceeds the operational requirements established for the system almost 30 years ago. Our allies and any potential rivals are assured the U.S. strategic deterrent is ready, credible, and effective. However, we must remain vigilant about age-related issues to ensure a continued high level of reliability.

The Trident II (D5) SWS has been deployed on our *Ohio*-class ballistic missile submarines for over 20 years, and is planned for a service life of 50 years. This is well beyond its original design life of 25 years and more than double the historical service life of any previous sea-based deterrent system. As a result, significant effort will be required to sustain a credible and viable SLBM force from now until the end of the current *Ohio*-class SSBN in the 2040s as well as the end of the service life of the *Ohio* Replacement SSBN in the 2080s.

The Navy is proactively taking steps to address aging and technology obsolescence. SSP is extending the life of the Trident II (D5) SWS 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, to control costs and sustain the demonstrated performance of the system. 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.

In 2012, the Navy conducted the first flight test of the D5 life-extension (LE) guidance system. The second guidance flight test is scheduled in the third quarter of fiscal year 2013. This past year, the D5 LE command sequencer completed its package qualification. The remaining electronics packages are on schedule.

Another major step to ensure the continued sustainment of our SWS is our SSP Shipboard Integration efforts, which utilize open architecture and commercial off-the-shelf hardware and software for shipboard systems. The first increment of this update is being installed throughout the fleet and training facilities. To date, installation is complete on 12 U.S. SSBNs and all 4 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.

To sustain the Trident II (D5) 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 refurbishment maintains the military capability of the original W76 for an additional 30 years.

The Navy is also in the initial stages of refurbishing the W88 reentry system. The Navy is collaborating with the Air Force to reduce costs through shared technology. In particular, the Air Force and Navy, consistent with Nuclear Weapon's Council direction, are conducting studies examining the feasibility of a joint approach for fuzes for the Navy's Mk5/W88, the Air Force's Mk21/W87 and the future W78 and W88 Life Extension Programs. We believe the joint replacement fuze program is feasible and has the potential of several major benefits for the Nation, including the potential to achieve significant cost savings.

OHIO REPLACEMENT PROGRAM

The next priority, which is also one of the Navy's highest, 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 SSBN is designed, built, delivered, and tested on time with the right capabilities at an affordable cost.

The *Ohio* Replacement Program will replace the existing *Ohio*-class submarines. To lower development costs and leverage the proven reliability of the Trident II (D5) SWS, the *Ohio* replacement SSBN will enter service with the Trident II (D5) SWS and D5 life-extended missiles onboard. These D5 life extended missiles will be shared with the existing *Ohio*-class submarine until the current *Ohio*-class retires. Maintaining one SWS during the transition to the *Ohio*-class replacement is beneficial from a cost, performance, and risk reduction standpoint.

The Navy team continues to leverage from the *Virginia*-class program to implement lessons-learned and ensure the *Ohio* replacement program pursues affordability initiatives and life cycle operations and support. Maintaining this capability is critical to the continued success of our sea-based strategic deterrent now and well into the 2080s.

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. While lead ship construction has shifted from 2019 to 2021, we are maintaining the original program of record for the design of the common missile compartment and SWS deliverables in order to meet our obligations to the United Kingdom. The United States and United Kingdom are working jointly to prioritize risk and develop a mitigation plan under the auspices of the Polaris Sales Agreement. Any delay to the common missile compartment has the potential to impact the U.K.'s ability to maintain a continuous at sea deterrent posture.

The United States and the United Kingdom have maintained a shared commitment to nuclear deterrence through the Polaris Sales Agreement since April 1963.

This month marks the 50th anniversary of this agreement, and I am pleased to report that our longstanding partnership with the United Kingdom remains strong. The United States will continue to maintain its strong strategic relationship with the United Kingdom as we execute our Trident II (D5) Life Extension Program and as we develop the common missile compartment.

As the Director of SSP, I am the U.S. Project Officer for the Polaris Sales 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.

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, the U.K. *Vanguard*-class, as well as in the future on our respective follow-on platforms. This is of particular importance as the reliance on the sea-based leg of the Triad increases as New START treaty reductions are implemented. 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.

SOLID ROCKET MOTOR (SRM) INDUSTRIAL BASE

The fourth priority I would like to discuss is the importance of the defense and aerospace industrial base. In particular, the decline in demand for the SRM industry has placed a heavy burden on Navy resources. The Navy is maintaining a continuous production capability at a minimum sustaining rate of twelve rocket motor sets per year. However, we previously have faced significant cost challenges as both NASA and Air Force demands have declined.

Over the past few years, the Navy has worked with our industry partners to reduce overhead costs and minimize cost increases to the Department. Despite many efforts to address this issue, the industrial base remains volatile. Potential future unit cost increases due to further decline in SRM industrial base demand could impact the D5 Life Extension Program. We will continue to cautiously monitor the industrial base.

SSP will continue to work with our industry partners, DOD, senior NASA leadership, Air Force and Congress to sustain the Solid Rocket Motor industrial base and find ways to maintain successful partnerships to ensure this vital national capability is preserved.

COLLABORATION WITH THE AIR FORCE

The final topic I would like to address is strategic collaboration between the Services. The Navy and the Air Force are both addressing the challenges of sustaining aging strategic weapon systems and have begun to work collaboratively to ensure these capabilities are retained in the long-term to meet our requirements. To do so, we are seeking opportunities to leverage technologies and make the best use of scarce resources.

The Navy and the Air Force have established an Executive Steering Group to identify and investigate potential collaboration opportunties and oversee collaborative investments for sustainment of our strategic systems. As a part of this effort, technology area working groups have been established to study collaboration opportunities in the areas of Reentry, Guidance, Propulsion, Launcher, Radiation Hardened Electronics, Ground Test and Flight Test systems, and Nuclear Weapons Security/Surety. In accordance with the joint explanatory statement of the conference report accompanying the National Defense Authorization Act for Fiscal Year 2013, the Navy and Air Force will brief the congressional defense committees later this year on efforts that can be jointly undertaken and cost-shared.

The entire spectrum of potential commonality must be analyzed with the goal of using commonality where appropriate while ensuring essential diversity where needed, and being good stewards of taxpayer funds. The timing is now to address collaboration opportunities to maintain our ballistic missile capability in the long-term.

CONCLUSION

SSP continues to maintain a safe, secure, and effective strategic deterrent capability and focus on the custody and accountability of the nuclear assets entrusted to the Navy. Our budget request provides the necessary funds to sustain this capability in fiscal year 2014. However, we must continue to be vigilant about unforeseen age-related issues to ensure the high reliability required of our SWS. SSP must maintain the engineering support and critical skills of our industry and government team to address any future issues with the current system as well as prepare for the future of the program.

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 rivals 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 FISCHER. Good to hear. Thanks.

STATEMENT OF MAJ. GEN. GARRETT HARENCAK, USAF, ASSISTANT CHIEF OF STAFF, STRATEGIC DETERRENCE AND NUCLEAR INTEGRATION

General HARENCAK. Senator, the triad is one of those enduring ideas that, regardless of the fact that the world has changed many times since we first embarked on a triad, it has proven itself to be one of those ideas that time has not come to get rid of it. It is as relevant today as it was when we first embarked this decades ago.

[The prepared statement of Major General Harencak follows:]

PREPARED STATEMENT BY MAJ. GEN. GARRETT HARENCAK, USAF

INTRODUCTION

Chairman Udall, Ranking Member Sessions, and distinguished members of the committee, thank you for the opportunity to discuss Air Force strategic programs.

As the Assistant Chief of Staff for Strategic Deterrence and Nuclear Integration, my team, on behalf of the Chief of Staff of the Air Force, leads planning, policy development, advocacy, integration, and assessment for the airmen and weapon systems performing Nuclear Deterrence Operations, a core function of our U.S. Air Force. Stewardship of the nuclear enterprise remains a top Air Force priority, in fulfillment of the President's mandate that the United States maintain a safe, secure, and effective deterrent as long as these weapons exist. While the challenges our Air Force faces in today's fiscally constrained environment are numerous, we remain committed to making the necessary investments in the sustainment and modernization of our nuclear deterrence capabilities, and in the stewardship of our airmen responsible for this vital mission.

NUCLEAR DETERRENCE IN THE 21ST CENTURY

For 21st century deterrence, one size does not fit all. Successfully deterring near-peers and other nuclear-armed states requires new thinking and tailored application. However, deterrence must, as it always has, deny adversaries the incentive to use their nuclear capabilities. The non-peer case may be the most challenging, and will require a renewed understanding of what motivates these actors as well as critical thinking on how best to address the threats they pose.

As affirmed in the January 2012 Strategic Guidance, our power projection capabilities must remain credible in the eyes of potential adversaries across the spectrum of conflict, increasingly so in pre-crisis situations. In regional contexts, the assurances and extended deterrence the United States provides to our allies are integral to strengthening security relationships and supporting nonproliferation goals. The employment of B–52 and B–2 bombers over the Korean Peninsula in the March 2013 Foal Eagle exercise recently demonstrated how the United States can simultaneously signal resolve to our allies and deter aggression. Such effects are highly valuable and increase in importance in a complex, multi-polar environment.

PRIORITIZING INVESTMENT ACROSS THE ENTERPRISE

In order to invest in only the highest priority needs across the nuclear enterprise, the Air Force has continued to rigorously assess the objectives of every program relative to its cost. In some instances, we have found it necessary to restructure, defer, or terminate programs with unsustainable cost growth and technical challenges—for example, with the Common Vertical Lift Support Platform program, and the Family of Advanced Beyond Line-of-Sight Terminals. These decisions are difficult and often carry commensurate risks that must be continuously balanced against operational requirements.

The B61 Life Extension Program (LEP) remains one of our most important priorities. As the primary gravity weapon employed by our long-range bombers and dual-capable aircraft, the B61 plays a central role in providing extended deterrence and assurance to our allies. Originally designed and fielded in the 1960s, the aging B61

will fail to meet requirements early in the next decade. By consolidating four existing B61variants into a single one—the B61–12—the LEP will result in a safer and more reliable weapon with reduced sustainment costs. While refurbishment of the B61's nuclear explosive package is the responsibility of the Department of Energy (DOE), the Air Force is responsible for the B61–12 Tailkit Assembly (TKA), as well as integration of the weapon on its various platforms. The November 2012 award of the B61–12 TKA development contract was an important milestone in the Air Force's commitment to meeting DOE's anticipated delivery of the B61–12 first production unit in fiscal year 2019.

Progress continues apace on an array of modernization programs for our capable yet aging fleet of long-range B–52 and B–2 bombers. These assets provide the President with the ability to hold at risk virtually any target on the globe with a full range of conventional and nuclear weapons. On a daily basis, this highly valuable, Air Force-unique capability forces adversaries who consider threatening our national interests and those of our allies to confront the potential costs of losing what they hold most dear. Despite continual investments in the B–2—our only long-range, direct-strike asset capable of penetrating in anti-access/area denial environments—over time the ability of this platform to prevail against advanced emerging threats is projected to diminish.

For that reason, efforts are underway to develop and field the Long-Range Strike Bomber (LRS–B), a Department of Defense commitment to ensuring the United States maintains its ability to project power globally in the decades to come. To deliver a force of 80–100 of these new bombers beginning in the mid-2020s, we are relying upon a streamlined acquisition strategy that balances capability with affordability. While the requirement for a new bomber is being driven primarily by a validated gap in conventional capability, LRS–B will be nuclear-capable at Initial Operational Capability, and nuclear-certified 2 years later.

In concert with LRS–B, the Long-Range Standoff (LRSO) program—the follow-on nuclear-capable cruise missile that will replace the 1980s-era Air Launched Cruise Missile (ALCM)—is advancing. Notably, the LRSO Analysis of Alternatives (AoA) was recently completed and is pending validation by the Joint Requirements Oversight Counsel (JROC) in May 2013. LRSO will be designed at its outset to be compatible with the B–52, B–2, and LRS–B. We are collaborating closely with DOE to select a life-extended warhead for LRSO that will ensure the system remains a highly credible deterrent in the decades to come. In the meantime, a comprehensive service life extension program is underway for the ALCM that will sustain its effectiveness through 2030.

We are executing a similarly robust modernization plan for our Nation's Intercontinental Ballistic Missile (ICBM) deterrent, the Minuteman III, to ensure it remains effective and credible through 2030. In support of that objective, multiple lines of effort are underway that will update its fuzing, solid rocket motor, and guidance systems. Looking beyond 2030, efforts commenced last year to evaluate initial requirements and capabilities for a Ground Based Strategic Deterrence (GBSD) ICBM follow-on program. In August 2012, the JROC validated the GBSD Initial Capabilities Document, and completion of a formal AoA is expected in fiscal year 2014.

The Air Force continues to strengthen all aspects of the nuclear security mission at our installations in the United States and abroad. In recent years, integration of state-of-the-art detection, assessment, and denial technologies throughout our weapons storage areas, ICBM silos, and other nuclear-related sites have provided our highly-skilled and motivated security forces with the tools and capabilities they need to face any potential threat. The opening of the Air Force's new Nuclear Security Tactics Training Center last December at Camp Guernsey, WY, further enhances the readiness of our airmen entrusted with nuclear security responsibilities.

Lastly, I am pleased that ongoing efforts by Air Force and Joint stakeholders to renew focus on our Nation's aging Nuclear Command, Control, and Communications (NC3) architecture have begun yielding measureable progress. The effectiveness of our NC3 platforms, systems, and facilities to support timely and informed decision making during times of crisis and war is critically important to ensuring strategic stability. As the Air Force is responsible for a major portion of our Nation's NC3 systems, we are leading efforts to develop a synchronized investment strategy for NC3 modernization and recapitalization. Towards that end, over the past 3 years, the Air Force has established strong partnerships internally and across the Department of Defense to codify and refine NC3 responsibilities and to align investment priorities.

NEW START IMPLEMENTATION

Under the terms of the New START treaty (NST) which entered into force in February 2011, the United States and Russian Federation are obligated to reduce and limit their strategic forces in accordance with the treaty's central limits no later than February 2018. In order to ensure our ICBM and heavy bomber force is compliant with NST's central limits by the deadline, we have fully funded implementation activities necessary to achieve the baseline force structure previously reported to Congress. While a final NST force structure decision is pending, the Air Force has begun working to eliminate treaty-accountable systems no longer used to perform the nuclear mission. These activities include the elimination of non-operational heavy bombers at Davis-Monthan Air Force Base, as well as environmental assessments required to eliminate empty, non-operational ICBM silos.

HUMAN CAPITAL

Every day, roughly 36,000 airmen perform Nuclear Deterrence Operations throughout the Air Force. These exceptional professionals provide the highest levels of stewardship to ensure our deterrent remains safe, secure, and effective. We continue to institutionalize fixes and create an enduring culture of accountability, compliance, and self-assessment throughout our nuclear units. While not conclusive indicators, positive trends such as increasing pass rates and a leveling of repeat deficiencies in our rigorous nuclear inspection program reflect the considerable progress we have made in recent years.

After concluding that we could do more to support the development of our nuclear-focused airmen, in February 2013 the Air Force approved a recommendation to split the career field for space and ICBM operations into two distinct fields. This realignment underpins a more deliberate approach to cultivating field-grade officer nuclear expertise and developing ICBM-focused commanders.

CLOSING

Maintaining ready, diverse, and resilient nuclear deterrence capabilities is critical to ensuring stability in today's profoundly complex and evolving national security paradigm. The distinctive attributes of the Air Force's deterrent forces—the responsiveness of the ICBM and the flexibility and visibility of the bomber—are ideally suited to meet this challenge. As the challenges to maintaining stability inevitably grow in the years to come, the United States must be prepared to meet them.

The President's fiscal year 2014 budget submission makes hard choices, but retains the commitment to a strong nuclear deterrent through modernization and recapitalization programs. That commitment is made manifest every day by the airmen performing deterrence operations, who demonstrate those capabilities with precision and reliability. They are trustworthy stewards of our most powerful weapons, vital to our Nation as we endeavor to maintain stability in the 21st century.

Senator FISCHER. Thank you, General. Thank you to all the panel.

Thank you, Mr. Chairman.

Senator UDALL. Thank you, Senator Fischer.

Secretary Creedon, let me turn back to you. I want to ask you about the fiscal year 2014 budget. How does the fiscal year 2014 budget request reflect force structure changes associated with the New START treaty?

Ms. CREEDON. The way that the fiscal year 2014 budget request is structured is it allows both the Air Force and the Navy to continue their preparatory work that will support a decision that will be made in the context of fiscal year 2015 to implement either a reduction in the total number of deployed and total number of delivery systems. So, that could be reductions in ICBMs or that could be reductions in the number of tubes, in other words on submarines, so that the tubes could be modified so that they would no longer be capable of launching a submarine-launched ballistic missile (SLBM).

The decision as to which of those options we choose has not been made yet, but the way that the 2014 budget structure is designed

is to preserve the option as we get closer in time, as we understand more about the pros and cons of each option, and frankly, as we get more into where the whole geopolitical situation is going, where we're going with further discussions with Russia, it allows us to maintain that flexibility for as long as possible before we make a decision.

Senator UDALL. Let me talk about the recent ICBM test launch out of Vandenberg that was cancelled in an effort to prevent escalation of the current tensions with North Korea. Those launches have been underway for 20 years, you well know, and they're important to ensuring the reliability of our deterrent. Do you anticipate any additional delays for this testing program?

Ms. CREEDON. At the moment, Senator, as you indicated, we thought it was wise to postpone for a while the last launch because of the situation on the Korean Peninsula. Right now it is the plan of DOD and it's the plan of the Air Force to do the next launch on time. We have a window of May 21 to 23. That is the current schedule.

What we've actually done is the system that was going to be launched—so that this particular launch is actually just going to move to the right, and so we'll move everything to the right a little bit. We do recognize very much the importance of these tests, not only to DOD, but also to DOE, because they're also a significant participant in these tests.

They do provide valuable information and we need to make sure that these go forward. It was a situation that we just wanted to deal with in a way the we didn't increase the provocation cycle that's been going on on the Korean Peninsula. So we thought it was a prudent idea to postpone for a short while this test. But at the moment, as I say, we're on track to do it again in May.

Senator UDALL. That update's appreciated.

Let me stay on the subject of North Korea. As I mentioned in my opening remarks, this crisis has again underlined the importance of our deterrent. Very recently three B–2 and then four B–52H aircraft participated in a joint training exercise on the peninsula, and this was especially important, as I see it, to South Korea as a demonstration of our nuclear umbrella.

Do you see any signs that nations that are protected by our nuclear assurance are questioning our resolve in this area? Should they have any reason for concern?

Ms. CREEDON. They should not. We have a very extensive dialogue. There are two sets of bilateral dialogues, one with Japan and one with the South Koreans. We spend a lot of time on these dialogues. They're extraordinarily important that they have complete and total confidence in our strategic deterrent.

Last week we just had yet another one of these dialogues. They were with the Japanese and we took them up to Bangor. The Navy was quite an extraordinary host in terms of providing an insight into the capabilities of the Navy. Previously, we had had the South Koreans out at U.S. Strategic Command (STRATCOM).

So we have put a lot of emphasis into this, into these dialogues. It's extraordinarily important that they feel confident in this deterrence and that they are completely and totally assured at all times, because we recognize that either of these countries, if they wanted

to, could develop nuclear weapons and it would be extraordinarily important for them not to and would really increase the tensions in that part of the world if they decided that this was a road down which they wanted to go.

So it's a vitally important series of dialogues.

Senator UDALL. Thanks for that update.

Let me turn to Senator Sessions and recognize him.

Senator SESSIONS. Thank you.

Secretary Creedon, there's a problem there. A March 10th New York Times report said and this is talking about North Korea and South Korea, South Koreans specifically: "Now this new sense of vulnerability is causing some influential South Koreans to break a decades-old taboo by openly calling for the South to develop its own nuclear arsenal, a move that would raise the stakes in what is already one of the world's most militarized regions."

It goes on to say: "While few here think this will happen any time soon, two recent opinion polls show two-thirds of South Koreans support the idea, posed by a small but growing number of politicians and columnists, a reflection, analysts say, of the hardening attitudes since North Korea's underground test."

I remember talking with members of this commission, talking about our other allies in the region. I don't know that it's appropriate to mention them. But they expressed concern about this immediately. They're worried about it. When you have the President saying in South Korea just a few weeks ago, or last year, he said:

> "As President, I have changed our nuclear posture to reduce the number and role of nuclear weapons in our national security strategy. I made it clear the United States will not develop new nuclear warheads, we will not pursue new military missions for military weapons. We have narrowed the ranges of contingencies under which we would ever use or threaten to use nuclear weapons."

That was March 2012 in South Korea. So I think you need to work extra hard right now because you're correct, we have a lot of allies that could produce nuclear weapons. If the goal is to constrain the number of nations that have them—and I think that's a good goal—then we need to be sure. South Korea can't be sitting there with North Korea with nuclear weapons and they don't have them and not have confidence that the United States—or have confidence the United States won't be there.

Can you share with me a little more of your thoughts on that?

Ms. CREEDON. Yes, sir. That was part and parcel of why not only did we carry on the exercise, the Full Eagle Exercise, but also why we had very visible presences of the bombers, particularly the B–2 bomber, because it's not just the nuclear umbrella that provides the assurance and the deterrence to our allies in the region. It's the whole package. It's all the conventional forces, it's the ballistic missile defense forces. We have Aegis cruisers over there in the region.

We're in the process of putting in place a second TPY–2 radar to provide not only for the defense of Japan, but the defense of our assets in the region. There's already one TPY–2 radar over there. We're moving a Terminal High Altitude Area Defense battery to

Guam. Parts of the battery have already been delivered. We're providing a broad package of assurance.

So it's not just nuclear; it's everything. Even the decision that we took to add 14 additional ground-based interceptors in Fort Greely had a reassurance effect to our allies because it also makes it very clear that we take the threat from that region very seriously.

So this is something that we've had a lot of focus on. It is part of a much larger package. Nuclear is an important part of it, but it's all the conventional systems, it's all the assets. It's also very much the reason why DOD has increased focus and will continue to increase focus on that part of the region generally, as was outlined.

Senator SESSIONS. For the South Koreans and the Japanese, having a nuclear-armed North Korea and them not having nuclear arms and to have any uncertainty about the willingness of the United States to defend them is a dangerous thing. That's how the Korean War broke out to begin with, a misunderstanding as to what the United States considered its vital national interest.

So I just worry about that and I think we have to get that clear. We need to get moving with a—so my time is about up, but we'll have another round, I guess.

But thank you for sharing that. We need to air it. We need to be honest about it. This is not a little bitty issue, and that's why it's so important with Iran. I wish we could just look the other way, but it's not going to be good for the whole region if Iran gets nuclear weapons either. It's a matter of great strategic importance.

Thank you, Mr. Chairman.

Senator UDALL. Senator Fischer, back to you.

Senator FISCHER. Thank you, Mr. Chairman.

General Kowalski, do you think that the Minuteman III ICBM still provides value to our nuclear forces, and if so, do you see that value diminishing any time soon?

General KOWALSKI. I think absolutely it provides value. As we look at the nuclear powers of the world, you have the major nuclear powers, Russia and China, and then you have these regional powers, clearly North Korea being the latest to demonstrate both a weapon and potentially a capability to deliver that weapon. We have Iran on a trajectory where they have the potential to have both weapons and already the delivery systems with their space program.

So what the ICBM provides in a world that is increasingly complex is, first, that ready, responsive, deterrent posture against the major nuclear powers. Second, what it provides is an assurance that no nuclear power can exercise nuclear coercion or blackmail on the United States. There are 450 hardened launch facilities in the heartland of this country and if we did not have those we need to think through what that scenario looks like in 15 or 20 years.

So I continue to be a strong advocate for the ICBM.

Senator FISCHER. Thank you.

In your prepared statement, you talk about extending it until 2030, I believe. Yes, 2030. There's some concern about the components aging out. Do you think that the missile can be extended far into the future? Are we going to be able to do that?

General KOWALSKI. I think I am confident we can get the missile as it is to 2030 with the programs that we have in place or the programs that we don't have funded yet, but plan to pursue in the next couple of years. For example, the propulsion replacement program. We know we're going to have to replace the propellant. We're not really sure when that will age out and when that program needs to start. We're taking a little bit of risk because we think the propellant can last 30 years, which puts at about 2025, 2027. If it doesn't, if it needs to be done sooner, then we'll need to start that in a couple of years.

We'll be starting that. That is actually a program that we are aligned to execute with the Navy so that we can go to a common propellant. These are some of the things that we're examining and in particular, the Air Force Materiel Command is examining with Admiral Benedict's team.

The missile guidance set is another area that we're looking at for commonality. But all of the things that we plan to invest in the Minuteman III are things, are specific subsystems that we intend to dovetail into the ground-based strategic deterrent, so the follow-up. So with the AoA, we'll have a better sense of what ground-based strategic deterrent is going to look like. As we develop the next missile guidance set, the next propulsion replacement for the Minuteman III and we look at the launch facility equipment, then what we intend to do is do that adaptation, so that we're not paying for the same thing twice with the follow-on.

Senator FISCHER. Do we have the resources to do all that?

General KOWALSKI. I'm confident that we do. All of Global Strike Command is less than 1 percent of the DOD budget, and I think when you look at the surety and the security that our nuclear forces provide, I think it's a sound investment.

Senator FISCHER. Do you think that the priority will remain that into the future that you see?

General KOWALSKI. Senator, that's not a decision I get to make.

Senator FISCHER. Come on.

General KOWALSKI. But I'll continue to advocate strongly for it.

Senator FISCHER. Thank you.

Did anyone want to add anything to that? [No response.]

Thank you very much.

Thank you, Mr. Chairman.

Senator UDALL. Thank you, Senator Fischer.

Secretary Creedon, let me come back to you for a final question. In the NDAA last year we established a commission to examine the role of the National Nuclear Security Administration (NNSA) in meeting DOD's stockpile requirements. DOD is tasked with setting up that commission. Can you update us on the status of the commission?

Ms. CREEDON. Yes, sir. First, we understand that of the 12 members that need to be appointed, 10 are appointed. There are two left that need to be appointed. When the direction was provided in the NDAA for the DOD to fund this commission, this panel, it was considered a new start under the budget and so because we were operating under a Continuing Resolution (CR) at the time we couldn't move forward with the funding for the new START, as you're well aware of all this history with the new START.

Now that we have a budget in place, we can now go forward with the reprogramming to support this. So what we're doing right now is finding the money to be able to include either in a below-threshold reprogramming or in an above-threshold reprogramming so we can get the commission started, hopefully in time with the full commitment of the members of the panel.

The other thing that we've been looking at is talking to several Federally Funded Research and Development Centers to see what their capabilities are to support this panel, for lack of a better description, the care and feeding of the panel, taking care of the logistics, helping with the writing, that sort of thing. So we're trying to get that teed up so when the chair and the co-chair are designated, that we can meet with them and present some options to them.

Senator UDALL. Thank you for that update. Also, thank you for reminding those of us sitting at this end of the table that CRs, although they're seductive in that you can think they're saving costs, they actually can add costs. I know my colleagues believe the regular order makes more sense up on the Hill and when we appropriate in the right way.

Let me turn to General Harencak. Are you satisfied with the Air Force's relationship with the NWC and would you make any recommendations to improve it?

General HARENCAK. Senator, I think if you look back at the history of the NWC, there have been times where there has been a lot of inactivity. I think recently, in the past few years, the NWC has been making lots of decisions, which is necessary, lots of great interaction. I believe overall, the relationship is very strong between the U.S. Air Force and the NWC. Recommendations would be, to the extent at all possible within the framework of how it was birthed and how we staff it, that the more continuity we can give, through either a professional staff or a group of people who maybe might be assigned to it for extended periods of time, would be helpful, simply because of the fact that there's nothing we do in the nuclear enterprise that can get done in 2, 3, or 4 years. Most of what we work on have very long lead times. It takes a long time for a lot of good reasons. To the extent that we could provide any type of continuity throughout periods of the timeframes necessary to get the nuclear enterprise to accomplish things, would be helpful.

Senator UDALL. As you think further about that, if you do have additional recommendations or thoughts, we'd certainly be open to hearing those.

Let me turn to another relationship that you have with the Navy. Are you satisfied with the progress on the common Navy-Air Force warhead system and would you make any recommendations for its improvement?

General HARENCAK. Senator, I'm very satisfied with the relationship that we have with Admiral Benedict and the Navy. I think we're making huge breakthroughs, if you will, on working on a very difficult and complex set of problems as we look to have adaptable external systems that we could both use in the future.

My recommendation would only be that, while we believe it will be successful, I am very optimistic, the U.S. Air Force is very optimistic, that this will be a successful endeavor. I think we have to be mindful of the fact that should there come a time where we be-

lieve for whatever reason that it not be feasible or affordable to do so, that we have the good sense, if you will, to say, "hey, we tried it." It may not work for a host of reasons, maybe technical reasons, or just the world has changed, so to speak.

I think we have to be ready to have some off-ramps on that. But right now I remain very optimistic. I will tell you the Navy is very supportive of what we're doing and we're working extremely well together on it.

Senator UDALL. Admiral, you want to comment briefly and follow on?

Admiral BENEDICT. Yes, sir, if I may. I appreciate the Air Force comments. We are fully supportive of a common warhead moving forward. I will tell you in all honesty we had challenges this year. Specifically, we did not have a prior budget line item. So again, we were significantly impacted under the CR in our ability to move forward under no new start authority from an acquisition standpoint.

Now that we have an appropriations bill, the Navy is aggressively attempting to solve that and we will. We do have money in the 2014 budget to support the Interoperable Warhead (IW), 78/88 LEP.

But I also echo what General Harencak said. I think it is prudent that as we move forward we have off-ramps. This is an extremely technically challenging proposal, and I have advocated and the Navy has advocated, that we do look at a stand-alone 88–1 as a potential off-ramp. But the bottom line is we're fully supportive of this effort moving forward.

Admiral BENEDICT. Thank you.

Senator Sessions, the floor is yours.

Senator SESSIONS. All right, thank you.

The NWC we hope will have good benefits. There has always been in my view some disconnect between DOD and DOE, NNSA, and all the processes that go into long-range planning and production of nuclear weapons.

So, Secretary Creedon, are you satisfied or can you speak for DOD; are you fully satisfied? Could there be improvement in having more transparency within NNSA in the decisionmaking process?

Ms. CREEDON. Senator, over the course of the almost 2 years since I've been there, so having watched this and being able to compare when I participated in the NWC 14 years ago, it's actually much more aggressive. The relationship is much better between DOE and DOD. We meet regularly and, thanks to a lot of Andy Weber's good work—Andy's the Executive Director of the NWC—and the participation with pretty much everybody on this panel, it really has been much more of a forum for a lot of really good discussion.

It truly ranges from agreement to the knockdown-dragout that sometimes has to happen to get you to agreement. That's been with and amongst the Services, DOE, and all of the various components. So, I think we've made a huge amount of progress. It's been, frankly, a little bit painful, but we really have made a lot of progress.

I think the Cost Analysis Program Evaluation (CAPE) group at DOD also has brought their cost expertise to this, too, and has

shared a little bit of that with NNSA. So we're making progress. We're not there yet, but we're making a lot of progress.

Senator SESSIONS. One of the dysfunctions to me has always been it's really DOD that's the customer because the weapon is being produced for them, and DOE just produces it and they don't have sufficient incentive, in my opinion, to reduce cost. DOD doesn't have that much incentive because if DOE produces it at less cost it doesn't go to DOD; it just is lost to DOE.

So DOE, it's just pretty obvious to me, has not had a sense of intensity. If DOD were making these weapons and they needed more money for ships and they could save money in making the weapons, they'd be saving the money and trying to move it over to make ships with. It's just a bureaucratic problem here, in my view.

I think the NWC, Secretary Weber, should be aggressive. You should bring cost controls to it, and I salute you for that and the taxpayers need that.

On the nuclear modernization, Secretary Creedon, in 2010 the President promised to increase spending for NNSA weapons activities by $4.1 billion over 5 years, less than $1 billion a year, fiscal year 2012 through 2016. Including the 2014 budget request, however, we're now $1.4 billion, 34 percent, below that promised target at the rate we're going.

Congress was responsible for one of the reductions and some of the others. The SLEP on the B61 slipped by 2 years. The program to examine a common warhead and to extend the life of the W78 and W88 may be 3 years, I understand, behind schedule. Delivery systems, development of a replacement for our nuclear ballistic missile submarines, that are at an average age of 23 years, is 2 years behind schedule. Replacement of the nuclear air-launched cruise missiles, average age 31 years, are at least 2 years behind schedule. There's no commitment yet to follow up on the Minuteman ICBM, average life 34 years. The new strategic bomber will not be nuclear-certified at the outset.

So with respect to Secretary Creedon and the Service witnesses, would you comment on these weapons systems? Can we expect further delays and what is the risk and how can we catch up?

Ms. CREEDON. Senator, I want to go back a little bit to what you said about the NWC. So almost every one of these decisions that have been made with respect to the timing of all of these, both the warheads and the platforms, have all been made in the context of NWC discussions.

Senator SESSIONS. Could I just say, that is good to hear. I think that's a positive step. When you go to them and say, "we don't have any money, can we go another year," they tend to want to go along with you. But it doesn't necessarily mean that that's what they'd prefer. We are getting at a point where it's worrisome.

But go ahead. I'm sorry.

Ms. CREEDON. No, that's fine. So let me just use the 61 as an exemplar of this, because otherwise we'd be here for quite a while. On the 61, the NNSA made a proposal to DOD based on guidance that DOD had provided. The NWC looked at what the scope of this SLEP would be, and then we also looked at what we thought the life of the B61 would be.

So STRATCOM and the Air Force went back and did some careful analysis and said: "Okay, based on the various components, this is when we think this program is going to age out, this is when we think we have to start this SLEP." Then the NWC looked at the scope of the SLEP. They went back and looked at the scope of the SLEP and decided that it was too technically challenging and it was too expensive.

So with this iterative work that was done, the scope got narrower, the understanding of the life of the 61 got better, and so we combined the two and said: Okay, this first production unit in 2019 is good, STRATCOM said this is good, and the scope of this SLEP is good, this is what we can afford, we believe. So the NNSA went off and they're now in the process of refining the costs, because right now the range of estimates is pretty big. So that's what the NNSA is doing, and they will come back to the NWC and we'll review this again.

So we'll look at both the timing and we'll look at the scope again, because we want to make sure that it's affordable, because now DOD is also providing money directly to the NNSA to help them with this whole enterprise.

So I think just using that as an exemplar explains how we are, in fact, working together, how we're making some of these tradeoffs and we're providing incentives on both sides to look at where is the affordability and where is the requirement.

Senator UDALL. Thank you.

Senator Fischer, we're back to you.

Senator FISCHER. I'd like to discuss Oak Ridge and Chemistry and Metallurgy Research Replacement (CMRR), those facilities. This is new to me, so hopefully you can enlighten me on some of this. I understand that those facilities need to be replaced and it's very expensive to replace them; is that correct? We're looking at pit production numbers. There's some discrepancy there on what DOD says is needed compared to DOE; is that correct? Who wants to tackle this one?

Mr. WEBER. I'll volunteer, Senator.

Senator FISCHER. Okay. Do you know what I'm referring to on the discrepancy in the numbers from 50 to 80 or 20 to 30, what we're talking about there, and where you stand on that and why you probably have a different position, if you could explain that?

Mr. WEBER. Yes, Senator. The NWC spends a lot of time working with DOE on the recapitalization of the infrastructure. Based on the good work of the Strategic Posture Commission, we really have a bipartisan path forward. We all agree we need to modernize this complex, retain and train the next generation of first-class scientists and engineers who make it work.

The facility at Oak Ridge, the uranium processing facility, is a very high priority because the building that is currently used for production of the secondaries is at risk and is old and we need to replace that as soon as possible. So in our prioritization we worked with NNSA to accelerate completion of that new uranium processing facility.

We accepted at least a 5-year deferral in the CMRR facility at Los Alamos National Laboratory (LANL), which does the analytical chemistry to support pit production. We all agree we need a pit

production capacity and the discrepancy in the numbers is more about timing and I don't really believe it's a discrepancy.

DOE has sent to Congress last year a reprogramming request for $120 million to meet near-term pit production needs and to allow us to get up to the 30 per year by 2021 for these very important SLEPs, especially the IW one or the 78/88 SLEP for the ICBM and the SLBM legs of our triad.

The NWC was briefed recently on what looks like a more affordable long-term plan for plutonium pit production. The concept is for modular facilities, that the first one could come on line sooner. Our initial reaction is we support that. It needs more study. We are launching, together with NNSA, a 60-day study to do a business case analysis for that.

But there is no daylight between DOE and DOD on the need for both a near-term pit production capacity of 10 to 20 and then 30 by 2021, and then in the longer-term for a pit production capacity of 50 to 80 per year.

Thank you.

Senator FISCHER. Do you think that you'll need to cannibalize some of the older stockpiles that we have in order to keep our capabilities at full strength? Do you think that's going to happen? Is it feasible that that would work? Do you know if those pieces are going to fit into the other warheads?

Mr. WEBER. One of the very good news stories in recent years based on the work of the stockpile stewardship program, our understanding of nuclear weapons and how they work is better than it's ever been. We are now confident that we can reuse plutonium pits as we implement these SLEPs.

Senator FISCHER. May I interrupt you and ask, how are you confident that you can do that? Have you run tests on it or just in theory you're confident?

Mr. WEBER. Yes, DOE has a continuing program of experiments to provide the data that gives the director of LANL and Lawrence Livermore National Laboratory the confidence to say that they can do that.

In addition to reusing existing pits, we need that capability to remanufacture additional pits based on those designs of the pits that we will be reusing. That's why I would urge you to approve the $120 million reprogramming request, which is essential for getting that near-term capability which is needed for these vital SLEPs.

Thank you.

Senator FISCHER. Thank you very much.

Thank you, Mr. Chairman.

Senator UDALL. General Harencak, let me come back to you again. It's our understanding that as the New START treaty is implemented, Air Force missile wings would like some flexibilities in determining which silos to shut down. As I understand it, some of the silos are worse off than others. Do you support that approach?

General HARENCAK. Absolutely, Senator. I believe it's critical that we have the flexibility to do what's most cost-effective, what's most efficient, which makes the most sense, so we can accomplish the mission while also having the flexibility to look at and say, "okay, are there silos that have more water intrusion than the other ones," and just go across the force and say, "hey, it's smart

to pick this silo or that silo." So, the U.S. Air Force certainly supports having the flexibility to do that, sir.

Senator UDALL. It makes sense to me as well.

Talk, if you will, about sequestration and what do you see as the biggest effect of sequestration on the Air Force nuclear enterprise?

General HARENCAK. The Air Force nuclear enterprise, sir, remains safe, secure, and effective. We are absolutely prepared to do the mission. We're doing it each and every day, despite sequestration. However—and I'll defer this to General Kowalski, who can probably tell you more—obviously, as the longer it goes on there is going to be other issues besides a readiness issue. There's going to be issues of if we have money to take care of our people, to train them, to send them to schools, all that.

So right now readiness is not a factor, but sequester could obviously have long-term effects on the overall health of our people and our processes and our facilities.

Senator UDALL. I think my worry, and it's shared by a lot of my colleagues, is that we're all told to save and you'll compound your investment because of the compounding effect of interest, but you can see the opposite effect with sequestration, where you get a negative compounding of the effects. But we'll be talking about that more and more as sequestration takes hold.

Secretary Weber, let me come back to you, and I know you've touched on this. But are you comfortable with the relationship that the Services have with the NWC? I know Senator Sessions commented earlier as well.

Mr. WEBER. Yes. During my 4-year tenure it's been an excellent relationship. We have active participation of the Service Chiefs and the Service Secretaries in the NWC meetings and I think that's essential. The Vice Chairman represents their interests, but having them at the table when we discuss strategic programmatic decisions is very important, and that is a habit, a tradition now that we will continue.

Senator UDALL. I'm going to exercise my prerogative as chairman and end this open portion of the hearing now and we'll head over to the secure facility to continue the hearing in closed session. I'm going to look to my team here—I have to actually adjourn the subcommittee and then we'll move over to the closed session. We look forward to the testimony over there and we'll reconvene as soon as we possibly can.

Senator SESSIONS. Mr. Chairman, could I ask one thing?

Senator UDALL. Sure, Senator Sessions.

Senator SESSIONS. With regard to these buildings, I really want to be clear about it. Modular and that kind of thing—modernizing effectively our nuclear weapons arsenal is essential. It's the right thing to do, and it's not too much money to spend if it's necessary. But I would be willing to listen to ideas you have for modular or other things that I think ought to be examined carefully to see if we think those are feasible and will not result in further delays and uncertainties in this program. I'm sure the chairman would be delighted to have more information on it, but that's my firm view, that we need to be on track with this. I suspect we could do it with less expense, and if so, I'll be supportive of that.

Senator UDALL. I look forward to working with the ranking member.

We will reconvene in the secure facility. We are adjourned.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR MARK UDALL

FISCAL YEAR 2014 PRESIDENT'S BUDGET

1. Senator UDALL. Secretary Creedon, how does the fiscal year 2014 budget request reflect force structure changes associated with the New Strategic Arms Reduction Treaty (START) treaty (NST)?

Ms. CREEDON. The President's fiscal year 2014 budget request reflects the administration's commitment to modernize the critical U.S. nuclear forces that underpin a safe, secure, and effective nuclear deterrent. The President has not made a final decision yet on the details of U.S. nuclear force structure under the NST. The fiscal year 2014 budget request includes funds to enable planning for the necessary force structure reductions under the NST and to dismantle previously retired strategic systems that count under the NST.

NORTH KOREA

2. Senator UDALL. Secretary Creedon, the recent North Korean crisis demonstrated the importance of our deterrent. Very recently, three B–2 aircraft and four B–52H aircraft participated in a joint training exercise on the Korean Peninsula. This was especially important to South Korea as a demonstration of the U.S. so-called nuclear umbrella. Do you see any signs that nations are questioning our resolve in this area? Should they have any reason for concern?

Ms. CREEDON. The United States remains fully committed to the extended deterrence we provide the Republic of Korea and our allies and partners under the nuclear umbrella. The B–2 and B–52H missions were visible demonstrations of the seriousness we place on this commitment and the posture and capabilities that underpin it. U.S. extended deterrence is playing a central role in reinforcing security and stability on the Korean Peninsula and in the region, and my interactions with my counterparts in the region indicate they are certain of U.S. resolve.

SEQUESTRATION

3. Senator UDALL. General Harencak, what do you see as the biggest impact from sequestration to the Air Force nuclear enterprise?

General HARENCAK. In the near-term, the Air Force has been successful at managing the impact of sequestration on nuclear deterrence operations—ensuring that our strategic forces remain safe, secure, and effective day-to-day. While challenging, we are confident in our ability to mitigate the remainder of the required reductions in fiscal year 2013 with negligible mission impacts.

Beyond fiscal year 2013, the unknown effects of sequestration to the enterprise are cause for concern. Since the risks of underinvestment are cumulative and have a compounding adverse effect on readiness over time, the magnitude of the impact will ultimately depend on the duration of the sequester.

Under sequestration, Air Force Global Strike Command (AFGSC) has incurred a 10 percent reduction across its operation and maintenance accounts. While Air Force guidance implementing the reductions expressly prioritized flying hours directly supporting nuclear operations, the cuts are having tangible impacts elsewhere. Of particular note, the deferment of non-emergency Facility, Sustainment, Maintenance, Restoration, and Modernization projects at missile alert/launch facilities, weapons storage areas, and aircraft hangars is exacerbating the existing backlog of critical capital improvements, raising safety and security risks that over time, may erode the ability of these facilities to meet mission requirements. Cancellation of most temporary duty assignments is limiting professional development within the nuclear career field. Additionally, the furlough of civilian employees is negatively impacting productivity and mission continuity. Should these and other sequestration-related impacts persist into future years, their combined effect will eventually lead to the deterioration of core readiness within our nuclear forces.

4. Senator UDALL. General Kowalski, how is sequestration affecting your training and operational tempo?

General KOWALSKI. Sequestration has significantly affected training for B–52 Combat Mission Ready (CMR) crews. Only approximately 50 percent of B–52 crews are currently funded to maintain CMR status due to the reduction in flying hours for Combat Air Force (CAF) units. This reduction will reduce readiness and proficiency of B–52 crews while limiting available response options and the deterrence effectiveness of the B–52 force. B–2 Mission Capable (BMC) crews are no longer flying. This approach rightly prioritizes the readiness of CMR crews; however, the absence of BMC crews in current flying operations hinders surge capabilities and decreases operational oversight within the B–2 community. Intercontinental Ballistic Missile (ICBM) and UH1 crew training has not been affected by sequestration.

Sequestration induced an additional 18 percent cut to Flying Hour Program and Central Assets Management System overall budgets. The Continuous Bomber Presence is being supported with minimum crews (1.0 crew ratio). Although current AFGSC hours maintain minimum B–2 and B–52 Nuclear Deterrence Operations support, the reduction constrains AFGSC's operational flexibility to support operations beyond this minimum. The remaining crew force (equivalent of approximately two B–52 squadrons) stood down on April 8, 2013. This stand down is forecast to continue through the end of the fiscal year 2013 or longer, depending on future availability of resources. While we will strive to minimize the short-term impact of the flying hour reduction, mid- and long-term impacts of reduced flying proficiency has serious readiness and safety implications.

B–61

5. Senator UDALL. Secretary Weber, what is the status of the B–61 gravity bomb's Service Life Extension Program (SLEP), and are you narrowing down the cost estimates for it?

Mr. WEBER. Los Alamos and Sandia National Laboratories, through the joint Air Force—National Nuclear Security Administration (NNSA) SLEP for the B61, have made substantial progress—every program milestone so far has been achieved on schedule. The B61–12 will replace four existing variants of the B61. The approved schedule for the B61–12 includes achieving the first production unit no later than fiscal year 2019, which is essential to managing risks associated with component end of life. The B61–12 program has entered Phase 6.3 Engineering Development; system components are being developed to meet essential requirements in regard to safety, use control, performance, reliability, and produce-ability. This work precedes a production engineering phase of development leading to initial production. Our best estimate for the cost of the B61 SLEP (development and production) is reflected in the B61–12 Weapons Development and Cost Report (WDCR): $7.4 billion. The Department of Defense's (DOD) Cost Assessment and Program Evaluation (CAPE) office has recently completed an independent cost estimate that exceeds the WDCR estimate by $2.7 billion. The difference in the two estimates is based on different assumptions regarding the risk in achieving certain programmatic milestones on planned schedules. The Nuclear Weapons Council (NWC) is acutely aware of the cost of the B61–12 and has focused increased attention on cost control. CAPE is working closely with NNSA on this SLEP to ensure cost and schedule risks are effectively managed.

AIR LAUNCH CRUISE MISSILE

6. Senator UDALL. General Kowalski, are you comfortable with the ability of your airmen to maintain the Air Launched Cruise Missile (ALCM) to meet the U.S. Strategic Command's (STRATCOM) exercise requirements?

General KOWALSKI. Yes. The Cruise Missile Maintenance airmen of AFGSC continue to maintain the ALCM in a professional manner meeting all STRATCOM operation plan and exercise requirements. In conjunction with Air Force Materiel Command, a SLEP has been developed to ensure continued ALCM maintainability until 2030.

7. Senator UDALL. General Kowalski, the Air Force is considering a replacement for the ALCM and our understanding is that the Air Force is considering a plan that would not replace the maintenance handling equipment for that missile. Is that being considered as part of the Analysis of Alternatives (AoA) and do you support such as proposal?

General KOWALSKI. The AoA included new and modified support equipment based on historical precedence of legacy weapon systems as part of the cost comparison and analysis. As the long-range standoff (LRSO) concept matures, the Air Force will

continue to conduct supportability analysis to determine the appropriate mix of new and legacy ALCM support equipment to ensure the lowest possible sustainment costs and a smooth transition from ALCM to LRSO operations.

QUESTIONS SUBMITTED BY SENATOR JEFF SESSIONS

NUCLEAR MODERNIZATION

8. Senator SESSIONS. Secretary Creedon, please comment on the status of the following weapon systems to include whether or not further delays are anticipated and if so, the Office of the Secretary of Defense's (OSD) and the individual Services' assessments of risk associated with each program:

- W–76 Submarine-Launched Ballistic Missiles (SLBM) Warhead Life Extension Program (Navy)
- B–61 Gravity Bomb Life Extension Program (Air Force)
- W–78 (ICBM) and W–88 (SLBM) Common or Interoperable Warhead Program (Navy/Air Force)
- Follow-on Nuclear Ballistic Missile Submarine (SSBN) Program (Navy)
- Replacement for the Nuclear Air-Launched Cruise Missile (known as the LRSO) (Air Force)
- Follow-on to the Minuteman III ICBM (Air Force)
- Next Generation Strategic Bomber (Air Force)

Ms. CREEDON. As we deal with ongoing fiscal challenges, program adjustments including scheduling revisions may be necessary. In those instances, however, military requirements and risk management will be carefully considered. In the near future Congress will receive both the Stockpile Stewardship and Management Plan, and the Report on the Plan for the Nuclear Weapon Stockpile, Nuclear Weapons Complex, Nuclear Weapon Delivery Systems, and Nuclear Command and Control System for fiscal year 2014 as required by section 1043 of the National Defense Authorization Act for Fiscal Year 2012. These documents will provide details on current plans for the programs you identified.

RESPONSIVE NUCLEAR INFRASTRUCTURE AND NUCLEAR REDUCTIONS

9. Senator SESSIONS. Secretary Creedon, a key premise of the 2010 Nuclear Posture Review (NPR) was that a modern nuclear infrastructure was essential for facilitating reductions in the arsenal while sustaining deterrence under New START and, potentially, beyond. A responsive nuclear infrastructure was deemed necessary not only to meet our upcoming weapons SLEPs, but to be able to surge production in case there were a significant technical challenge with the current stockpile—or if the geopolitical situation changed dramatically for the worse. Is this linkage between achievement of a responsive infrastructure and nuclear reductions still administration policy?

Ms. CREEDON. As you stated, the modern infrastructure is needed whether or not there are further reductions below the NST force structure levels. That said, a more modern infrastructure will allow additional warhead reductions particularly in the hedge.

10. Senator SESSIONS. Secretary Creedon, the NPR concluded that funding for Chemistry and Metallurgy Research Replacement-Nuclear Facility (CMRR–NF) at Los Alamos and Uranium Processing Facility (UPF) at Oak Ridge was required to maintain a safe, secure, and effective nuclear arsenal and to provide that responsive nuclear infrastructure deemed necessary to facilitate nuclear reductions. In fact, the NPR recommended that CMRR–NF and UPF be available by 2021. With the uncertainty now surrounding the future of CMRR–NF, or perhaps a modular approach, doesn't this delay the achievement of that responsive nuclear infrastructure which was deemed necessary for arms reductions?

Ms. CREEDON. The administration's decision to defer CMRR–NF increases risk in our effort to achieve the responsive infrastructure identified in the NPR. To manage this risk in the near-term, we are developing other means to respond to technical or geopolitical challenges. We will achieve near-term goals using existing facilities with some modifications. At the same time, the administration is pursuing an enduring production capacity through potential pit reuse in ongoing SLEPs, and we plan to supplement this with a capability to manufacture existing insensitive high explosive pit designs at a rate of 30 per year by 2021.

Over the next several weeks, the NNSA, with support from DOD's CAPE office, will carry out a business case analysis of the modular concept and other alternatives

to consider risks and benefits, and to seek initial insights into feasibility of delivery of key capabilities. At the conclusion of the study, NNSA will report its assessment to the NWC and relevant congressional committees.

11. Senator SESSIONS. Secretary Creedon, since the administration has made the decision to defer CMRR by at least 5 years, shouldn't we also delay the negotiation of any further arms reductions below New START levels?

Ms. CREEDON. That is ultimately the President's decision. Deferral of the CMRR alone should not be considered an impediment to further arms reductions if the needs of the nuclear stockpile stewardship programs can be met and other circumstances allow for it.

RUSSIAN NON-STRATEGIC NUCLEAR WEAPONS

12. Senator SESSIONS. Secretary Creedon, last year you and Secretary Weber told this committee that: "Russia has approximately 4,000 to 6,500 nuclear weapons, according to unclassified estimates, of which approximately 2,000 to 4,000 are non-strategic." You and Secretary Weber also noted that: "we lack confidence in estimates of Russian tactical nuclear weapons." The administration has said it seeks to reduce tactical nuclear weapons in any future arms discussions with Russia, but Russia has established the condition that all U.S. tactical nuclear weapons must be removed from Europe before Russia agrees to any reductions in its tactical nuclear arsenal. Please describe the types of tactical nuclear weapons in the Russian arsenal that could pose a direct threat to North Atlantic Treaty Organization (NATO) Europe.

Ms. CREEDON. There are a variety of Russian systems that could pose a direct threat to NATO. I refer you to the Defense Intelligence Agency (DIA) Russian Nuclear Forces Quick Reference Guide, DIA–11–1111–538, dated January 2013; and DIA Russia: Nonstrategic Nuclear Weapons in the Euroatlantic Area, DIA–11–1206–678.A, dated June 29, 2012.

13. Senator SESSIONS. Secretary Creedon, could some of these weapons also threaten the U.S. Homeland, such as a nuclear cruise missile off the U.S. coast?

Ms. CREEDON. The potential exists that some Russian non-strategic weapon systems could threaten the U.S. Homeland. I refer you to the DIA Russian Nuclear Forces Quick Reference Guide, DIA–11–1111–538, dated January 2013; and DIA Russia: Nonstrategic Nuclear Weapons in the Euroatlantic Area, DIA–11–1206–678.A, dated June 29, 2012.

14. Senator SESSIONS. Secretary Creedon, what is your position on whether the United States should remove tactical nuclear weapons from Europe in exchange for reductions in Russian weapons?

Ms. CREEDON. While the removal of tactical nuclear weapons from Europe is ultimately the President's decision, the administration has committed to addressing these issues within the framework of the NATO alliance, not unilaterally. U.S. nuclear weapons in Europe are a core component of NATO's overall capability for deterrence and defense, alongside conventional and missile defense forces. In the 2012 Deterrence and Defense Posture Review (DDPR), NATO members reaffirmed this tenet and committed to remaining a nuclear alliance as long as nuclear weapons exist. The DDPR concluded that the "alliance's nuclear force posture currently meets the criteria for an effective deterrence and defence posture." The DDPR also acknowledges, however, that in a future security environment, the United States could reduce non-strategic (i.e., tactical) nuclear weapons in Europe, assuming a reciprocal reduction by Russia. Until then, and for as long as NATO remains a nuclear alliance, NATO will ensure that all components of its nuclear deterrent remain safe, secure, and effective.

15. Senator SESSIONS. Secretary Creedon, what is NATO's position on this subject?

Ms. CREEDON. While I certainly can't speak to the NATO position per se, nuclear weapons are a core component of NATO's overall capability for deterrence and defense, alongside conventional and missile defense forces. The 2012 DDPR reflects the consensus position of NATO members, and it commits to remaining a nuclear alliance as long as nuclear weapons exist. The DDPR concluded that the "alliance's nuclear force posture currently meets the criteria for an effective deterrence and defence posture." The DDPR also acknowledges, however, that in a future security environment, the United States could reduce non-strategic (i.e., tactical) nuclear

weapons in Europe, assuming a reciprocal reduction by Russia. Until then, and for as long as NATO remains a nuclear alliance, NATO will ensure that all components of its nuclear deterrent remain safe, secure, and effective.

16. Senator SESSIONS. Secretary Creedon, has the U.S. Government examined the feasibility of verifying Russian compliance with an agreement to reduce tactical nuclear weapons?

Ms. CREEDON. Although we have not yet begun detailed discussions with Russia on the topic of future nuclear reductions, we have begun to explore verification methodologies that might be used in future efforts to verify Russian non-strategic warhead reductions. The administration, in consultation with NATO allies, is working to initiate bilateral discussions with the Russian Federation on an agreement to address tactical nuclear weapons stockpiles of the United States and the Russian Federation in a verifiable manner.

17. Senator SESSIONS. Secretary Creedon, since cruise missiles, torpedoes, and rockets can be armed with conventional or nuclear warheads, how can we effectively verify tactical nuclear weapons on the Russian side?

Ms. CREEDON. Although we have not yet begun detailed discussions with Russia on the topic of future nuclear reductions, we have begun to explore verification methodologies that might be used in future efforts to verify Russian non-strategic warhead reductions. The administration, in consultation with NATO allies, is working to initiate bilateral discussions with the Russian Federation on an agreement to address tactical nuclear weapons stockpiles of the United States and the Russian Federation in a verifiable manner.

18. Senator SESSIONS. Secretary Creedon, given that the Russians maintain a robust nuclear production infrastructure, how can we verify that dismantled tactical nuclear weapons are not being replaced by new warheads?

Ms. CREEDON. Although we have not yet begun detailed discussions with Russia on the topic of future nuclear reductions, we have begun to explore verification methodologies that might be used in future efforts to verify Russian non-strategic warhead reductions. The administration, in consultation with NATO allies, is working to initiate bilateral discussions with the Russian Federation on an agreement to address tactical nuclear weapons stockpiles of the United States and the Russian Federation in a verifiable manner.

NUCLEAR DETERRENCE FUNDING

19. Senator SESSIONS. Secretary Creedon, according to figures presented to Congress last year in the so-called Section 1043 Report, the 10-year costs for U.S. nuclear delivery systems were approximately $119 billion, not including funding for a new bomber and a new ICBM. Furthermore, the 10-year cost to sustain and modernize the Nation's nuclear command and control system was estimated at $36 billion. This works out to a total of $255 billion over the next 10 years, not including the new bomber or ICBM. Can you update us on this 10-year figure, to include funding for the bomber and ICBM?

Ms. CREEDON. We are currently in the final stages of preparing an updated Section 1043 Report. When submitted, that report will provide updated 10-year cost data. The report will not include the full costs for the new bomber and ICBM. We are still in the early phases of the capability analysis process and have not selected a future system that could be used to develop a cost model.

20. Senator SESSIONS. Secretary Creedon, is it fair to include in this sum the entire bill for a new strategic bomber, which will also have a significant conventional mission?

Ms. CREEDON. Our budgeting system does not allow for splitting program costs among multiple missions assigned to the same platforms. Because of its global reach, the new heavy bomber is a strategic asset and probably best left under nuclear deterrence funding.

21. Senator SESSIONS. Secretary Creedon, this works out to about 4 percent of the total DOD budget. Why does the administration believe it is necessary to spend this much to maintain a credible nuclear deterrent?

Ms. CREEDON. The President has pledged 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 partners. These expenses reflect

investments in capabilities currently residing in systems that have largely outlasted their originally planned service lives. Finally, our budgeting system does not allow for splitting program costs among platforms performing multiple missions. Therefore, the full costs of systems like the long-range bomber that have a significant conventional mission are counted against U.S. nuclear deterrence. This is a substantial reduction from the much larger percentage, 17 percent of the DOD budget at the height of the Cold War.

22. Senator SESSIONS. Secretary Creedon, what are the threats in the future that warrant such an expense?

Ms. CREEDON. The array of nuclear-armed states and states pursuing nuclear weapons around the world complicates the global security environment. All of the countries that currently possess nuclear weapons have modernized, or are undergoing modernization, of their nuclear arsenals. This has resulted in weapons with longer ranges, improved means of delivery, and improved warhead types. The unpredictable security environment, in combination with these advancing capabilities, warrants such an expense.

U.S. NUCLEAR STRATEGY AND GUIDANCE

23. Senator SESSIONS. Secretary Creedon, when you appeared before this subcommittee in March 2012, you told us that the President should be ready to release the results of his 90-day Post NPR Implementation Study and his new nuclear employment strategy "within the next couple of weeks." It has yet to be released. Can you tell me when, if ever, the administration intends to divulge the results of the Post NPR Implementation Study?

Ms. CREEDON. The study is still underway and we will provide briefings on its results when it is complete.

24. Senator SESSIONS. Secretary Creedon, are there any significant changes to U.S. nuclear weapons employment guidance or nuclear strategy in the offing?

Ms. CREEDON. As stated in the NPR, the United States will continue to ensure that, in the calculations of any potential opponent, the perceived gains of attacking the United States or its allies and partners would be far outweighed by the unacceptable costs of the response. The NPR also stated that the size and pace of any future U.S. nuclear force reductions will be implemented in ways that maintain the reliability and effectiveness of security assurances to our allies and partners. The administration continues to work on the NPR implementation study.

25. Senator SESSIONS. Secretary Creedon, what is the purpose of revising long-held U.S. nuclear weapons guidance?

Ms. CREEDON. The administration is conducting a follow-on analysis called for in the 2010 NPR to update our assessment of deterrence requirements and develop options for potential future reductions in the U.S. nuclear arsenal. We needed to conduct this review because our 21st century deterrence challenges are fundamentally different from those we encountered in the last century. Every President in the nuclear age has reviewed U.S. plans and capabilities to ensure that they address the threats we face and maintain strategic deterrence and stability. Doing so is a necessary and appropriate exercise of the President's authority as Commander in Chief. Under the President's direction, DOD has conducted a nuclear force analysis that, among other things, considered potential changes in targeting requirements and force postures. As was the case following the 1994 and 2001 NPRs, after due consideration of the analysis, the administration will also revise guidance and operational plans to align with the President's nuclear policies.

26. Senator SESSIONS. Secretary Creedon, is the administration contemplating any changes in the alert status of U.S. nuclear forces?

Ms. CREEDON. The 2010 NPR considered the possibility of reducing alert rates for ICBMs and the at-sea rates of ballistic missile submarines. The NPR concluded that such steps could reduce crisis stability by giving an adversary the incentive to attack before re-alerting was complete. With that said, DOD is continuously assessing whether future changes to alert posture are possible and desirable; none are being considered at this time.

27. Senator SESSIONS. Secretary Creedon, is the administration contemplating any changes to the purposes for which nuclear weapons would be used?

Ms. CREEDON. The administration's declaratory policy for nuclear employment is laid out in the 2010 NPR, which states that the United States would only consider the use of nuclear weapons in extreme circumstances to defend the vital interests of the United States or its allies and partners. The NPR also delineates the U.S. formal Negative Security Assurance, which provides that "the United States will not use or threaten to use nuclear weapons against non-nuclear weapons states that are party to the Nonproliferation Treaty (NPT) and in compliance with their nuclear nonproliferation obligations." The NPR makes clear that the United States reserves the right to respond by nuclear means to any threat to its vital interests, or those of an ally or partner, by a state not in good standing with its NPT obligations or by nuclear weapon states, and by states not party to the NPT, regardless of whether the threat is posed by nuclear, biological, chemical, or other means.

NEW START FORCE STRUCTURE AND FURTHER REDUCTIONS

28. Senator SESSIONS. Secretary Creedon, has DOD made any decisions related to the elimination of deployed nuclear forces to accommodate the New START treaty limits of 700 deployed delivery systems and 1,550 nuclear warheads?

Ms. CREEDON. DOD is assessing the appropriate force structure under the New START treaty. A decision on reductions in U.S. forces to meet New START treaty limits is expected to be finalized before fiscal year 2015 begins. This timeline provides the flexibility to tailor our force structure to meet deterrence and assurance requirements while still enabling us to meet the Treaty's compliance date in February 2018.

29. Senator SESSIONS. Secretary Creedon, what will our nuclear force posture of ICBMs, SLBMs, and bombers look like in the next few years?

Ms. CREEDON. The U.S. nuclear force structure remains a triad of forces as described in the 2010 NPR because it is the best approach for maintaining effective U.S. nuclear deterrence. Maintaining the triad, modernizing the nuclear forces that comprise it, and modernizing the nuclear weapons infrastructure are—and will remain—national security priorities.

The President's budget request represents a responsible balance between our nuclear infrastructure modernization needs and the current fiscal environment/budget uncertainties. Given the declining defense budget, some strategic delivery system modernization efforts may proceed more slowly than desired. Within existing budget constraints, the administration, through the efforts of DOD and the NNSA, is modernizing U.S. strategic delivery systems and the nuclear complex and its associated infrastructure, and is sustaining the nuclear stockpile in accordance with its commitments to Congress and under the New START treaty.

30. Senator SESSIONS. Secretary Creedon, there are reports in the press that the administration is starting to talk with Russia about further nuclear reductions. Have you done the analysis to suggest that further reductions are in our national security interests? Please elaborate.

Ms. CREEDON. The administration has been conducting a NPR implementation study to review our nuclear deterrence requirements and operational plans to ensure they address today's threats. The analysis is not yet complete, but our preliminary view based on work to date is that further reductions consistent with the national security environment will be possible. Once the President reviews the results of the study and makes decisions regarding its recommendations, the administration will revise employment guidance and operational plans accordingly. The President's decisions regarding the study recommendations will also provide the foundation on which we can develop specific proposals regarding further nuclear reductions that we can use as the basis for discussions with Russia.

31. Senator SESSIONS. Secretary Creedon, do Chinese nuclear forces factor into this analysis?

Ms. CREEDON. Yes. As referenced in the 2010 NPR, any future reductions must continue to strengthen deterrence of potential regional adversaries, strategic stability vis-á-vis Russia and China, and assurance of our allies and partners. Although Russia's nuclear forces remain the significant factor in determining how much and how fast we are prepared to reduce U.S. forces, our force structure analysis also accounts for China's nuclear force modernization. We will also continue to engage with China in the areas of military transparency and sustaining strategic stability.

32. Senator SESSIONS. Secretary Creedon, does Russia want to pursue further reductions?

Ms. CREEDON. We believe that it is in Russia's interests to pursue further reductions. Because of improved relations with Russia, strict numerical parity in nuclear weapons is no longer as compelling as it was during the Cold War. On the other hand, large disparities in nuclear capabilities could raise concerns on both sides and among U.S. allies and partners, and may not be conducive to maintaining a stable, long-term strategic relationship, particularly at lower numbers. Therefore, we will continue to place importance on Russia joining us as we pursue additional reductions in nuclear stockpiles.

33. Senator SESSIONS. Secretary Creedon, to your knowledge, has Russia established any preconditions on missile defense, tactical nuclear weapons, conventional prompt strike, or any other items?

Ms. CREEDON. Although we are in the early stages of discussions with Russia on the topic of missile defense, we have not initiated discussions on tactical nuclear weapons or conventional prompt strike. I am not aware of any formal preconditions established by the Russian Federation on these topics. The President's Annual Report to Congress on Non-Strategic Nuclear Weapons (submitted pursuant to Condition 12(B) of the New START Treaty's Resolution of Ratification), however, sets forth details on Russia's well-known position on the distribution of U.S. non-strategic nuclear weapons and infrastructure, and may provide additional insight into possible Russian negotiating positions.

34. Senator SESSIONS. Secretary Creedon, do you intend to address the disparity in tactical nuclear weapons that was noted in the New START Resolution of Ratification? If so, will you do it in a verifiable manner?

Ms. CREEDON. Yes, the administration has been clear that future discussions with Russia should include non-strategic nuclear weapons, consistent with the Senate's Resolution of Advice and Consent to Ratification of the New START treaty.

35. Senator SESSIONS. Secretary Creedon, can you tell me how you intend to verify compliance with a treaty that addresses tactical nuclear weapons?

Ms. CREEDON. Although we have not yet begun detailed discussions with Russia on the topic of future nuclear reductions, we have begun to explore verification methodologies that might be used in future efforts to verify Russian non-strategic warhead reductions. The administration, in consultation with NATO allies, is working to initiate bilateral discussions with the Russian Federation on an agreement to address tactical nuclear weapons stockpiles of the United States and the Russian Federation in a verifiable manner.

36. Senator SESSIONS. Secretary Creedon, seven Senators on the Senate Select Committee on Intelligence (SSCI) sent a letter to Secretary of State Kerry "regarding compliance and verification issues associated with U.S.-Russia arms control agreements." Are you aware of this letter and the issues associated with it?

Ms. CREEDON. Yes.

37. Senator SESSIONS. Secretary Creedon, do you agree that we must address any potential Russian violations before proceeding with yet another arms reduction agreement?

Ms. CREEDON. Compliance with legal obligations is central to the effectiveness of arms control treaties, and concerns about non-compliance must be addressed. Although resolution of such issues with Russia is clearly important, I do not believe that discussions of further nuclear arms reductions need await resolution of all compliance issues.

38. Senator SESSIONS. Secretary Creedon, does the administration intend to seek Senate advice and consent for any future agreement with the Russians to reduce nuclear weapons?

Ms. CREEDON. The administration will consult closely with Congress regarding any additional arms control agreements, including whether such an agreement should occur through the treaty power and therefore be subject to Senate advice and consent.

39. Senator SESSIONS. Secretary Creedon, we were told during New START hearings that the resulting nuclear balance would be stable. If this is the case, why pursue another round of reductions which could upset stability if smaller U.S. forces

are vulnerable to a surprise Russian attack; and encourage other nuclear powers to build up to U.S. and Russian force levels?

Ms. CREEDON. Because of improved relations with Russia, strict numerical parity in nuclear weapons is no longer as compelling as it was during the Cold War. On the other hand, large disparities in nuclear capabilities could raise concerns on both sides and among U.S. allies and partners, and may not be conducive to maintaining a stable, long-term strategic relationship, particularly at lower numbers. Therefore, we will continue to place importance on Russia joining us as we pursue additional reductions in nuclear stockpiles. The United States and Russia together still account for a vast majority of the world's nuclear weapons, even after the central limits of the New START treaty are reached in February 2018. For this reason, our focus for the next stage of arms control remains bilateral efforts with Russia where we intend to pursue further reductions and transparency with Russia that would include all nuclear weapons—deployed and non-deployed, strategic and non-strategic—while ensuring that we maintain our commitments to stability with other nuclear powers, deterrence of potential adversaries, and assurance of our allies and partners.

40. Senator SESSIONS. Secretary Creedon, what, really, is the purpose of another round of reductions?

Ms. CREEDON. The array of nuclear-armed or nuclear weapons-pursuing states around the world complicates the global security environment. Despite this, even after the central limits of the New START treaty are reached in February 2018, the United States and Russia will still account for the majority of the world's nuclear weapons—and these are many more than are needed for deterrence. For this reason, our focus for the next stage of arms control remains bilateral efforts with Russia. Through these efforts we intend to pursue further reductions and expand transparency to include all nuclear weapons—deployed and non-deployed, strategic and non-strategic—while ensuring that we maintain our commitments to stability with other nuclear powers, deter potential adversaries, and assure our allies and partners at the lowest feasible numbers.

RESPONSIVE NUCLEAR INFRASTRUCTURE VIA MODULAR CONCEPT

41. Senator SESSIONS. Secretary Creedon, in the budget request for fiscal year 2013, the administration last year decided to defer by at least 5 years the start of construction of the CMRR–NF. This caused great concern because CMRR–NF was deemed necessary, even by the 2010 NPR, for a responsive nuclear infrastructure. Can you tell me whether the requirement for a responsive nuclear infrastructure, as defined in the NPR, is still valid?

Ms. CREEDON. A responsive nuclear infrastructure is still valid and remains our goal. A responsive infrastructure would allow the United States to shift away from retaining large numbers of non-deployed warheads as a technical hedge, allowing for additional reductions in the U.S. stockpile of non-deployed nuclear weapons.

42. Senator SESSIONS. Secretary Creedon, I understand the administration is now looking at a modular approach for the construction of the CMRR–NF that would build smaller buildings, as needed, and connect them by tunnels to Plutonium Facility-4, the pit production facility at Los Alamos. Can you tell me whether you think this approach is promising?

Ms. CREEDON. I think the concept has merit and is worth considering. Because the acquisition timeline for CMRR–NF now overlaps the timeline to recapitalize the Plutonium Facility-4, which is also aging, the NWC is exploring an integrated approach to the suite of support capabilities planned for CMRR–NF and to provide long-term pit manufacturing capability. Over the next several weeks, the NNSA, with support from DOD's CAPE office, will carry out a business case analysis of the modular concept and other alternatives to consider risks and benefits, and to seek initial insights into feasibility of delivery of key capabilities. At the conclusion of the study, NNSA will report its assessment to the NWC and relevant congressional committees.

43. Senator SESSIONS. Secretary Creedon, can we achieve that responsive infrastructure called for in the 2010 NPR via this modular approach?

Ms. CREEDON. Pit production is one factor of the responsive infrastructure documented in the NPR. The NNSA, with support from DOD's CAPE office, is carrying out a business case analysis of the modular concept and other options for a plutonium capability to seek initial insights into the feasibility of the modular concept,

and to address risks and benefits. Our plutonium strategy will enable an interim production capability of 30 pits per year by 2021 and would help to maintain critical skills in the workforce, which is another key piece of a responsive infrastructure. Success in this is underpinned by the approval of the reprogramming request that is needed to begin these actions.

44. Senator SESSIONS. Secretary Creedon, will DOD take a proactive role, using the NWC, to determine the feasibility of the modular approach by this summer?

Ms. CREEDON. Yes. We in the Office of the Under Secretary of Defense for Policy are working proactively through the NWC, in conjunction with the NNSA and our DOD counterparts, including the CAPE office, to ascertain whether the modular approach can deliver interim capabilities earlier than planned for CMRR–NF. We expect to complete this process in the next several months, although I cannot predict with certainty when this analysis will be complete.

[Whereupon, at 3:30 p.m., the subcommittee adjourned.]

DEPARTMENT OF DEFENSE AUTHORIZATION OF APPROPRIATIONS FOR FISCAL YEAR 2014 AND THE FUTURE YEARS DEFENSE PROGRAM

WEDNESDAY, APRIL 24, 2013

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

MILITARY SPACE PROGRAMS AND VIEWS ON DEPARTMENT OF DEFENSE USAGE OF THE ELECTROMAGNETIC SPECTRUM

The subcommittee met, pursuant to notice, at 2:30 p.m. in room SR–222, Russell Senate Office Building, Senator Mark Udall (chairman of the subcommittee) presiding.

Committee members present: Senators Udall, Sessions, and Fischer.

Majority staff member present: Jonathan S. Epstein, counsel.

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

Staff assistant present: Lauren M. Gillis.

Committee members' assistants present: Jason Rauch, assistant to Senator McCaskill; Casey Howard, assistant to Senator Udall; Lenwood Landrum, assistant to Senator Sessions; and Peter Schirtzinger, assistant to Senator Fischer.

OPENING STATEMENT OF SENATOR MARK UDALL, CHAIRMAN

Senator UDALL. Let me bring today's hearing of the Strategic Forces Subcommittee to order.

This afternoon, we will receive testimony from the Department of Defense (DOD) regarding military space programs for fiscal year 2014. We will also examine DOD's use of electromagnetic spectrum in a second panel.

For planning purposes, the first panel on DOD's space programs will end at 3:30 p.m. so that we can hear from the second panel on electromagnetic spectrum, and that second panel will end around 4 p.m.

We will take very short opening statements from our witnesses, no more than a minute or 2 to highlight anything they think is important for us to hear.

As always, I am honored to work with our distinguished ranking member, Senator Sessions. Colorado and Alabama have important

roles in space. Colorado is home to the Air Force's Space Command, and Alabama is home to the Army's Space and Missile Defense Command. We have the commanding generals from both commands here today, and I thank them and all the witnesses for taking the time to testify before the subcommittee.

With that, let me make some short comments regarding the fiscal year 2014 space budget.

The Air Force is finally making strides in bringing their satellite programs on track after years of cost overruns. That is a good news story. There are still open questions regarding launch services as DOD works to lower costs and balance the incumbent launch provider with new entrants. I would like to hear from General Shelton how we assure that we have reliable access to space while continuing to lower costs.

I look forward to hearing from the Army on how they are approaching access to space. My understanding is that they are developing low-cost, innovative space programs.

The Navy is now launching their mobile user satellite system which provides line-of-sight access to users around the world. I would like to hear how they are bringing the terminals online to receive the signals from the satellites.

In the policy area, I would like to hear about how we are implementing plans to protect our satellites from impacting with debris and other nations' satellites. I hope that we will be able to hear about policies to deter hostile actions that other nations might take against us in space.

Finally, I would like to hear from the Government Accountability Office (GAO) on what long-term problems they see in the area of disaggregation of large satellite systems. There has been a lot of talk here, but we do not know the long-term consequences.

Then finally for the second panel on electromagnetic spectrum, there has been much debate about DOD's use of a frequency band that has commercial potential. We must balance our national security while promoting cooperation and competition and economic growth that would come from commercial use of this band. I believe we can get there, and I think we all agree that it must be done in a careful and thoughtful way. I look forward to the second panel's views on this subject.

With that, let me turn to my ranking member and my friend, Senator Sessions, for his opening statement, and then we will move on to questions.

STATEMENT OF SENATOR JEFF SESSIONS

Senator SESSIONS. Thank you, Senator Udall. It is great to work with you and I appreciate your expertise and cooperativeness as we work together.

I will just be brief and maybe offer my full statement for the record.

We are keenly aware of the unprecedented budget situation facing DOD and we know that frugality is the order of the day. Managing capability development and acquisitions over the next 5 years will define for decades perhaps how space will either enable our warfighting capability or limit our warfighting capability.

I am pleased to see the Evolved Expendable Launch Vehicle (EELV) recorded a $1.1 billion reduction in costs over the next 5-year budget, and I applaud the Air Force in reducing cost. That was a competitive bid process you worked out. So we made some progress. I think that is something that people should know. That was quite a good thing.

We have the spectrum issue, as the chairman mentioned. I will not go into detail except that it has caused quite a bit of interest. It looks like DOD has estimated that moving to a new spectrum band could take at least 10 years and cost nearly $13 billion. So this is a matter that requires examination because we have private sector people who want to be engaged in this, and it is just a matter we will be able to talk about today.

Mr. Chairman, I look forward to hearing from this distinguished panel and appreciate the opportunity to share these remarks.

I welcome Senator Fischer for her great participation in these committees. She has weighed in already with great interest. I believe you like all these space, missile, atom bomb issues.

Senator FISCHER. I do.

Senator SESSIONS. I know. You do actually. Thank you for your leadership.

[The prepared statement of Senator Sessions follows:]

PREPARED STATEMENT BY SENATOR JEFF SESSIONS

Thank you very much, Mr. Chairman, I join you in welcoming our distinguished panel of witnesses. I would like to extend a special welcome to Lieutenant General Richard Formica, the Commander of the Army Space and Missile Defense Command in Huntsville. We have two panels and many witnesses so in the interest of time I will keep my opening remarks brief.

The purpose of the first panel of our hearing today is to discuss the President's fiscal year 2014 budget request for military space programs. We are all keenly aware of the unprecedented budget situation facing the Department of Defense. Nothing is immune to budget cuts, including strategic enablers such as defense space systems. Managing capability development and acquisitions over the next 5 years will define for decades how space will either enable our warfighting capacity or limit our global reach. Today's hearing affords us the opportunity to assess these challenges and better understand the impact they will have on the space enterprise. I look forward to discussing with each of our witnesses the steps they are taking to maximize capability with fewer resources.

After many years of cost overruns and delays, I am pleased to report that the fiscal year 2014 Air Force budget archives a cost savings of $2.8 billion across three of the Departments costliest space programs. I mentioned in our hearing last year that space launch is an area where more must be done to address affordability pleased to see that the Evolved Expendable Launch Vehicle, also known as EELV, recorded a $1.1 billion reduction over the 5 year budget and applaud the Air Force for its focus on reducing cost. I look forward to better understanding if and how such savings will be reinvested within the space program to ensure continued space dominance.

Our second panel will focus on the Defense Department's electromagnetic spectrum requirements and long-term planning. A national initiative to maximize usage and free up additional spectrum for public consumption has caused many to examine the Department of Defense's utilization. The private sector has expressed growing interest in freeing spectrum bands for auction currently occupied by DOD such as the 1755 to 1850 Megahertz band. Unfortunately, few thus far have proposed a plan which ensures full reimbursement and comparable alternative spectrum elsewhere for the Pentagon. The Department has estimated that moving to a new spectrum band would take at least 10 years and cost nearly $13 billion. While some have suggested breaking that band into smaller bites, the technical feasibility of doing so remains unclear.

I fully support the goal to free additional spectrum to ensure global competitiveness, but in doing so we must ensure that the Department is not left holding the bill. With over $1 trillion in Defense spending at risk under sequester, the Defense

Department is in no place to move to any new spectrum bands without guarantees that it will be fully reimbursed and that mission readiness will not be impeded.

Senator UDALL. Thank you, Senator Sessions. It is truly important that Senator Fischer is involved and we welcome her engagement in this important subcommittee.

In the spirit of my opening remarks, I mentioned I would like each one of you, if you are so inclined, to give us a 1- to 2-minute statement and then we will go right to questions. So we will start to our left and work right across the panel.

Secretary Loverro?

STATEMENT OF MR. DOUGLAS L. LOVERRO, DEPUTY ASSISTANT SECRETARY OF DEFENSE, SPACE POLICY

Mr. LOVERRO. Thank you, Chairman Udall and Ranking Member Sessions, Senator Fischer. Thank you for the opportunity to testify this afternoon.

A year ago, Assistant Secretary Madelyn Creedon testified here about the progress of implementing the national space security strategy. I am pleased to join General Shelton, Lieutenant General Formica, Dr. Zangardi, and Ms. Chaplain to continue that discussion today.

Let me start with the basic reality that space remains vital to our national security. You have both expressed that. But the evolving strategic environment increasingly challenges U.S. space advantages, advantages that both our warfighters and our adversaries have come to appreciate. As space becomes more congested, competitive, and contested, DOD must formulate programs and policies that will secure those advantages for years to come.

That reality is juxtaposed with the fact that as a Nation, we are providing these capabilities and environment that is increasingly cost-constrained. The growing challenges of budget, in addition to increasing external threats, compel us to think and act differently so that in the future what we choose to procure, how we choose to provision it, and the policies we govern it with reflect both our changed threat and fiscal environments.

While these two realities present us with a clear challenge, I do not, by any means, view them with a sense of doom or gloom. Newer entrepreneurial suppliers, alongside our legacy suppliers, are creating an ever-burgeoning commercial space market that can provide significant advantage to DOD if we formulate the policies and strategies to encourage their growth and use.

Similarly, there has been a growth worldwide in allied space investment and capability, and those provide a significant opportunity for DOD to help us build resilience into our space capabilities.

The policies and strategies that I will discuss here today begin to address those challenges and opportunities, but they are just the initial steps in an area that will continue to demand attention and action from all of us.

Thank you very much, and I look forward to your questions.

[The prepared statement of Mr. Loverro follows:]

PREPARED STATEMENT BY DOUGLAS L. LOVERRO

Chairman Udall, Ranking Member Sessions, and members of the subcommittee, I am pleased to join General Shelton, Lieutenant General Formica, Dr. Zangardi, and Ms. Chaplain to testify on Department of Defense space programs and policies. A year ago, Assistant Secretary Madelyn Creedon testified here about the progress in implementing the National Security Space Strategy. I am pleased to continue that discussion today.

Space remains vital to our national security, but the evolving strategic environment increasingly challenges U.S. space advantages. U.S. space capabilities allow our military to see with clarity, communicate with certainty, navigate with accuracy, and operate with assurance. Those capabilities, however, are being provided in a space environment that is increasingly congested, contested, and competitive. Space is increasingly congested, with tens of thousands of trackable manmade objects in orbit, contested, by an ever-increasing number of manmade threats, and competitive, as the U.S. technological lead in space is challenged.

As a country, we are providing these capabilities in an environment that is severely cost-constrained. Space programs are, by their very nature, expensive, and as vulnerable to budget pressure as other government activities. Poorly planned past approaches to space programs have trapped us in a vicious cycle of delayed capability, mounting cost, and increased risk. The growing challenges of the budget, in addition to increasing external threats, compel us now to think and act differently so that in the future what we choose to procure, and how we choose to provision it, will reflect the changed space and fiscal environments.

At the same time, it is not all doom and gloom. Over the last decade, we have seen a welcome growth in the U.S. space sector as newer entrepreneurial suppliers have begun to enter the space arena in both the launch and satellite markets. They are creating a burgeoning commercial space market that can provide significant advantage to DOD if we formulate the policies and strategies to encourage their growth and use. The policies and strategies that I will discuss today begin to address these challenges and opportunities, but these are just initial steps in an area that will continue to demand attention and action from us all.

I would like to begin with a success story, one that not only energizes our industrial base, but also illustrates that our response to the challenges we face must involve the whole U.S. Government—DOD, State, Commerce, Congress, and others—as well as industry. A robust, competitive, and healthy industrial base underpins everything that we do in space. Over the past 2 decades, the health and competitiveness of the U.S. space industrial base has been challenged by overly restrictive export controls on satellites and related items. The changes made in the National Defense Authorization Act for Fiscal Year 2013 put us on a path to modernize and appropriately tailor those export controls to allow industry to compete for sale of those items that are widely available, while focusing export controls on those items most critical to national security. I extend my thanks to Congress, and particularly this committee, for all of the hard work that went into enacting this legislative change.

Updating satellite export controls will provide the U.S. satellite industry with an opportunity to restore its leadership by allowing it to compete on a more level playing field with its international competitors. This will be particularly beneficial to small- and medium-sized second and third tier U.S. companies that manufacture parts and components for satellites. These reforms will reduce the current incentives for satellite and component manufacturers in other countries to design out or avoid U.S.-origin content. In addition to improving the health and competitiveness of our industrial base, tailoring satellite export controls benefits national security by facilitating cooperation with our Allies and export control regime partners while maintaining robust controls necessary to protect national security.

Moving forward, satellites and related items will follow the existing procedures of the President's Export Control Reform Initiative for rebuilding the categories of the U.S. Munitions List (USML) and their corresponding Commerce Control List (CCL) categories. The interagency team of Commerce, State, Defense, NASA, and the intelligence community will build on the substantial technical work they put into the report required by section 1248 of the National Defense Authorization Act for Fiscal Year 2010 to revise Category XV, Satellites and Related Items, of the USML and its CCL complement. Following a period of public comment on the draft categories, which should begin this spring, the interagency team will make changes based on those comments and consult with Congress both informally and formally before publishing final revised categories, hopefully by the end of the year. We look forward to working with you and our interagency partners to make these important changes to benefit the space industrial base and ultimately our national security.

I view this as an extremely positive first step. But if we are to fully empower our commercial sector, as well as continue to derive the substantial benefits space confers, it will require more than just enhanced supplier access. It requires that we create a safe, stable, and secure space environment. We are pursuing several initiatives that seek to do just that.

Space situational awareness (SSA) is foundational to all of our space activities. SSA capabilities provide the ability to avoid collision with debris or other active spacecraft, as well as rapidly detect, warn, characterize, and attribute natural or manmade phenomena affecting space systems. But effective SSA requires cooperation among space actors—we cannot do it alone. The increasingly congested space environment means that an unprecedented level of information sharing is needed among those actors to promote safe and responsible operations in space and to reduce the likelihood of mishaps, misperceptions, and mistrust. This year, the Commander of U.S. Strategic Command (STRATCOM) signed the first SSA data sharing agreement with a foreign government, and many more are in varying stages of negotiation. These agreements will complement STRATCOM's more than 35 existing SSA sharing agreements with commercial satellite operators. With the extension of this authority to foreign governments, the United States will be able to better assist our partners with current space operations and lay the groundwork for future cooperative projects. Consistent with existing legislative authority, we are committed to providing SSA services to increase the safety of spaceflight for space-faring nations.

As more countries and companies field space capabilities, it is in everyone's interest to act responsibly and protect the safety and sustainability of the space domain. Much as we promoted the now well-accepted rules of the sea in centuries past to stimulate commerce, enhance security, and isolate irresponsible actors, the United States is taking a leading role in international efforts to promote responsible, peaceful, and safe use of space. A more cooperative, predictable environment enhances U.S. national security and discourages destabilizing crisis behavior. Working closely with the Department of State, we are supporting development of data standards, best practice guidelines, and transparency and confidence-building measures for responsible space operations. For instance, we are actively participating with other U.S. departments and agencies in the United Nations (U.N.) Committee on the Peaceful Uses of Outer Space's work on furthering the long-term sustainability of space, as well as U.S. inputs to a study by a U.N. Group of Government Experts, which is examining possible transparency and confidence building measures.

The Department of Defense supports U.S. efforts to work with the European Union and other spacefaring countries to develop an International Code of Conduct for Outer Space Activities. A widely-subscribed Code will encourage responsible space behavior and help identify those who act otherwise, thereby reducing risk of misunderstanding and misconduct. The draft International Code of Conduct focuses on reducing the risk of debris creation and increasing the transparency of space operations. It reflects U.S. best practices and is consistent with current U.S. practices such as notification of space launches and sharing of space data to avoid collisions.

It is important to note that the draft Code of Conduct is not legally binding and that it recognizes the inherent right of self-defense. It focuses on activities, rather than unverifiable capabilities, and better serves our interests than the legally-binding but unverifiable ban on "space weapons" proposed by others. We are committed to ensuring that any Code of Conduct for space activities advances, rather than hampers, our national security, and we will continue to actively participate in international negotiations to shape the Code. With each subsequent draft of the Code, we will assess the text for any potential adverse programmatic or operational impact to ensure that a final Code fully supports our national interests. We are committed to working with the Department of State to keep you informed on the process of developing an international Code of Conduct.

Working with international partners to encourage responsible behavior in space is only a part of our engagement with other space actors. We are also pursuing opportunities to partner with responsible nations, international organizations, and commercial firms to augment the U.S. national security space posture. Through these partnerships, we can ensure access to information and services from a more diverse set of systems. This provides a direct advantage in a contested space environment. Decisions on partnering are made consistent with U.S. policy and international commitments and take mutual performance benefits, costs, protection of sources and methods, and effects on the U.S. industrial base into consideration.

While space is a domain in which we once operated unchallenged and independent, increasingly we need to operate in space as we do in other domains: in coalitions. Led by General Kehler at STRATCOM, the Department is working with close allies to develop the Combined Space Operations (CSpO) concept. CSpO is a multinational effort focused on cooperation, collaboration, and the integration of

military space activities to strengthen deterrence, improve mission assurance, and enhance resilience while optimizing resources across the participating countries. We have completed an initial period of discovery with close allies and are working to further refine the concept and eventually broaden participation to include additional spacefaring countries.

Our allies have significant and growing space-based capabilities in a range of mission areas. By leveraging their systems, we can augment our capabilities, add diversity and resilience to our architectures, and complicate the decisionmaking of potential adversaries. For example, last year we signed an agreement with Canada to incorporate data from their recently launched Sapphire sensor into the U.S. Space Surveillance Network, and an agreement with Australia to jointly operate a C-band ground-based radar system from the southern hemisphere. We are also exploring jointly operating a Space Surveillance Telescope (SST) on Australian soil. These efforts enhance our collective SSA capabilities, and will directly contribute to the long-term safety and sustainability of the domain. Cooperation can also better enable coalition operations on land, at sea, and in the air, since space-based capabilities are critical enablers of capabilities in these other domains.

As I already mentioned, commercial entities are increasingly important to the Department, and we are pursuing strategic partnerships with these firms to stabilize costs and improve resilience. We are exploring innovative approaches, such as multi-year contract authority or co-investment for commercial space services, hosted payloads, and disaggregated architectures in order to take advantage of the most competitive sectors of our space market. The Department has developed criteria to certify the reliability of new space launch vehicles and will openly compete up to 14 national security space launches in the next 5 years. To spur that certification and competition, we recently awarded two scientific missions to one of these firms and placed several other launch providers on contract for future similar missions. Those efforts will help to demonstrate the full range of capabilities necessary to launch the existing range of national security missions.

At the same time, we have guaranteed our current launch provider at least twenty-eight launches. Doing so provides stability to an industrial base that provides critical services, but also ensures a level playing field for competition that can spur innovation, improve capabilities, and most importantly reduce costs without increasing risk. To spur continued growth in the commercial space sector and to foster the competition that creates benefits, which DOD can reap, we will complement these efforts with policies that guarantee a level playing field in the future. Over the next few years we will begin those same steps on the satellite side of our architectures, emphasizing the use of the competitive market and diversity of capability to not only drive down costs but also to enhance resilience and U.S. industrial competitiveness.

All of these efforts across the Department are being led and overseen by a rejuvenated governance structure. The changes to the management and coordination of the national security space enterprise, including the establishment of the Defense Space Council, and the designation of the Secretary of the Air Force as the Executive Agent for Space, have resulted in significant improvements in information flow across DOD and among U.S. departments and agencies. It has also improved the process for acquisition and policy decisions. We understand Congress' action to reinstate the Operationally Responsive Space (ORS) office and funding, and are working to ensure its goals are realized across future space programs.

Many of the things that I discussed today have been briefed to you previously as part of the National Space Policy and National Security Space Strategy (NSSS). We have continued our implementation of the NSSS this year, incorporating these concepts into our first update of the Department of Defense's Space Policy in 13 years. The DOD Space Policy implements the National Space Policy and NSSS within the formal DOD system of directives, regulations, and guidance, and reflects the Department of Defense's 2012 Strategic Guidance. Together with the June 2012 National Military Strategy for Space Operations, the policy update institutionalizes the changes that DOD is making in a constrained budget environment to address the complex set of space-related challenges and opportunities it faces.

The Department looks forward to working closely with Congress, our interagency partners, our allies, and U.S. industry to continue implementing this new approach to space.

Senator UDALL. Thank you.
Secretary Zangardi?

STATEMENT OF DR. JOHN A. ZANGARDI, DEPUTY ASSISTANT SECRETARY OF THE NAVY FOR COMMAND, CONTROL, COMMUNICATIONS, COMPUTERS, INTELLIGENCE, INFORMATION OPERATIONS, AND SPACE

Dr. ZANGARDI. Good afternoon. Chairman Udall, Ranking Member Sessions and Senator Fischer, thank you for the privilege to speak before you today. I will keep my comments very brief.

At last year's hearing, we discussed the launch of the first Mobile User Objective System (MUOS) satellite and the great accomplishments of the program. I am happy to report that the program has continued to progress towards full capability. MUOS–1 became operational to the warfighter, supporting legacy Ultra-High Frequency (UHF) operations on November 2, 2012. Additionally, MUOS–2 is on schedule to launch from Cape Canaveral on July 19, which will bring us one step closer to providing global communications access to the warfighter.

Terminal development continues to progress as the MUOS waveform was completed in November 2012 and made available on the Joint Tactical Network Center information repository for use by commercial vendors in December 2012. Multiple vendors have downloaded the waveform and are working to develop radios which will be used by all Services. Once MUOS–2 completes its 90-day on-orbit checkout, the Navy will continue its risk reduction events to thoroughly test all portions of the wideband code division, multiple access (WCDMA) capability to include the satellites, ground stations, Defense Information Systems Agency (DISA) teleports, and the radios. Although we expect to have challenges in each of the scheduled risk reduction events, we are confident that this early testing will enable a successful operational evaluation. We expect to have an operational WCDMA capability by summer 2014.

Significant accomplishments have been made at three of the four ground stations. Sites at Geraldton, Australia, Wahiawa, Hawaii, and northwest Virginia have completed final hardware installation and will complete final acceptance testing this summer. The final site in Niscemi, Italy, is expected to be complete by December 2014.

The Navy will continue to focus on the successful deployment and development of the MUOS constellation and the replacement of legacy UHF capability. I want to point out that there has been tremendous teamwork in this program between the Navy, Army, DISA, and the Office of the Secretary of Defense (OSD) to deliver this capability. Industry has delivered in this case on cost.

Senator, I am standing by for your questions.

[The prepared statement of Dr. Zangardi follows:]

PREPARED STATEMENT BY DR. JOHN A. ZANGARDI

INTRODUCTION

Mr. Chairman, distinguished members of the subcommittee, I am honored to appear before you today to address the Navy's space activities. Space capabilities form the foundation of the Navy's ability to operate forward, especially as the Navy shifts it focus towards the Pacific. As a forward deployed force, the Navy is highly dependent upon space-based systems for over-the-horizon communications and battlespace awareness in support of joint warfighting and global maritime operations. Air-Sea

battle, the joint operational concept through which air and naval forces retain freedom of action through tight coordination of operations in and across multiple domains, highlights the particular importance of the space domain. The United States has enjoyed uncontested superiority in the space domain for several decades; however, cheaper access to space, proliferation of jamming technology and the emergence of counter-space weapons have begun to level the playing field against peer and near-peer forces.

In an environment of emerging threats in space, the Navy will require continued robust investment and access to space to ensure mission success in a contested environment. Adversaries are becoming more proficient in their use of space capabilities and are developing both offensive and defensive space capabilities in an attempt to remove or reduce the asymmetric advantage the United States enjoys in the space domain. It is imperative the Navy continue to leverage space capabilities and work with the other Services to develop and refine the necessary tactics, techniques, procedures, and capabilities to retain Navy fleet information dominance in degraded or denied environments.

The Navy Strategy for Achieving Information Dominance (2012–2016) defines Information Dominance as the operational advantage gained from fully integrating the Navy's information functions, capabilities, and resources to optimize decision-making and maximize warfighting effects. Navy leaders increasingly rely on critical satellite communications (SATCOM) paths; positioning, navigation, and timing (PNT) signals; environmental monitoring data; missile warning (MW); and intelligence, surveillance, and reconnaissance (ISR) reporting for the full range of operations from humanitarian missions to combat operations in one or more theaters. Access to, and mastery in, operations utilizing this combination of space capabilities enables decisiveness, sustainability, responsiveness, and agility—critical requirements for a forward deployed and globally engaged force.

MOBILE USER OBJECTIVE SYSTEM (MUOS)

The increasing reliance on satellite communications and the uncertainty of the antiquated and aging legacy UHF capability are driving the Navy to improve narrowband capacity to support the joint warfighter. The Mobile User Objective System (MUOS) is the communications path that will best allow the Navy and DOD to meet the needs of the future while transitioning the user community from legacy UHF to a much improved wideband code division, multiple access (WCDMA) capability. This technology, which

is similar to third generation cellular technology, will not only improve bandwidth capacity but will also provide individual users true global access.

The MUOS program continues to make significant strides in achieving its program goals on time and within budget. In February 2012, the first satellite was launched and within 8 months was made operational, providing joint access that seamlessly transitioned without any degradation in service. The second MUOS satellite recently completed all pre-launch testing and is now undergoing final preparations for delivery to Cape Canaveral, FL in preparation for launch on July 19, 2013. The remaining three satellites are all on budget and on schedule.

In addition to the spacecraft, the MUOS program continues to meet objectives for the ground sites in Geraldton, Australia, Wahiawa, HI and Northwest, VA. These sites have recently completed final hardware installation and will complete final acceptance testing by the end of this summer. The last remaining site Niscemi, Sicily, in Italy, has had some setbacks in recent months as Italian protesters have delayed progress. The United States and the central Italian Governments are working together closely to maintain unfettered access to the site. Recently, the Italian government commissioned a radio frequency study to reassure the local population that all RF levels at the site are within normal operating levels. Two previous studies have been conducted by the U.S. Navy with acceptable results for both U.S. and Italian standards. The Navy's goal is to resume work at Niscemi by this summer to complete the site by the end of 2014 in preparation for the launch of MUOS 3.

The final segment needed to achieve full MUOS capability is the fielding of the MUOS-capable terminals. The MUOS waveform software was completed in November 2012 and placed in the Joint Tactical Network Center (JTNC) Information Repository and made available to industry in December 2012. The first terminal that will be fielded and used to complete MUOS End-to-End (E2E) testing will be the AN/PRC–155 Manpack Radio, previously known as Joint Tactical Radio System Manpack terminal. The U.S. Army PEO C3T Tactical Radio Program is developing this terminal by adding the MUOS capability to this new radio. Additionally, the Navy is currently providing RDT&E funds to develop a MUOS-capable Digital Mod-

ular Radio (DMR) to support shipboard operations. Other manufacturers are developing radios for use with MUOS in the near future.

Since the beginning of the MUOS program, development of the full MUOS capability has been managed through multiple program offices, including PMW–146 (Navy), Tactical Radio Program Office (Army), JTNC (Army) and the Defense Information Systems Agency. In May 2012, OSD (AT&L) assigned the Navy overall responsibility to deliver the MUOS E2E capability. In order to reduce risk associated with seams between each of the program offices, risk reduction testing has been added to the overall schedule. This testing will evaluate the interfaces between the space, ground, and terminal portions of the system. Testing began in March 2013 and will continue in phases through 2013 and 2014 as additional system components become available.

POSITIONING, NAVIGATION, AND TIMING

The Navy continues to use the Air Force's NAVSTAR Global Positioning System (GPS) as its primary source of space-based, precise PNT data for all platforms, munitions, combat systems, and command, control, communications, computer, and intelligence systems. GPS provides a common PNT reference for all U.S. military users as well as select coalition partners. GPS delivers the necessary underpinning for enabling Information Dominance across the Fleet. In order to maintain access to the data provided by GPS, especially in contested and denied environments, the Navy is taking proactive measures to ensure its continued reception and use.

Development of the Navy's recently awarded multi-year contract to Raytheon Integrated Defense Systems for a follow-on shipboard PNT fusion and distribution system, GPS-based PNT Service (GPNTS), continues to progress as scheduled. The GPNTS program is replacing legacy GPS shipboard user systems dating from the 1980s and 1990s and recently completed a successful Critical Design Review ahead of schedule. GPNTS incorporates the latest GPS security architecture and features redundant clocks as well as anti-jam antennas. It is being designed to incorporate the next generation of military GPS receivers capable of utilizing the new GPS M-code signal once it becomes available from the Air Force. GPNTS will also distribute common positioning data and synchronized precise time and frequency to all systems on a ship that require this information.

Additionally, the Navy continues to procure and install anti-jam GPS antennas on its manned aircraft and has initiated the development of GPS anti-jam antennas for both the submarine force and its fleet of unmanned aircraft systems.

Precise time and time interval is absolutely critical to the effective employment of a myriad of Department of Defense (DOD) systems, including weapons systems, command and control systems, communications systems, and information technology networks. The U.S. Naval Observatory (USNO) is responsible for maintaining precise time and time interval for all Department of Defense (DOD) users. Coordinated Universal Time (UTC) is the DOD standard and is the primary precise time reference for GPS and numerous other military applications. The Navy remains at the forefront of timekeeping technology. In fiscal year 2012, the USNO built and incorporated four new rubidium fountain atomic clocks to the Master Clock (MC) with full operating capability (FOC) scheduled for the end of fiscal year 2013. The installation of two rubidium fountain atomic clocks at the DOD Alternate Master Clock (AMC) facility is in progress with FOC scheduled for fiscal year 2015. These additions to USNO's timekeeping suite will improve the precision and accuracy of USNO UTC, which is required to support future Joint systems and operations. The Navy continues to closely coordinate with the Air Force to ensure the USNO Master Clock is fully supportive of the new GPS III architecture.

Additionally, the Navy has other ongoing initiatives to ensure precise time and time interval is readily available to all DOD users. These initiatives primarily include improving the current infrastructure for distributing precise time to DOD users and the development of alternate methods for distribution. These efforts are being resourced and executed in concert with DOD Chief Information Officer (CIO) priorities and long-term strategy for Assured PNT.

ENVIRONMENTAL MONITORING

Navy provides the DOD with global atmospheric modeling and global and regional ocean modeling. In October 2012, the Navy Operational Global Atmospheric Prediction System model was upgraded to the Navy Global Environmental Model, which immediately improved forecast accuracy. In order to produce these accurate forecasts, the Navy also relies on partnerships with the Air Force, civil, and international agencies to meet our space-based environmental sensing requirements. Meeting these requirements is critical to the planning for, and execution of, safe,

effective military operations. To this end, the Navy is fully engaged supporting the Space-Based Environmental Monitoring AoA that is being conducted by the Air Force to define requirements for the follow-on to the Defense Meteorological Satellite Program in order to mitigate potential national and international data collection gaps.

MISSILE WARNING AND INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE (ISR)

Space-based assets provide unique access to information critical to decision making, whether it is knowledge of an immediate military threat or insight into a hazard resulting from a natural disaster. The global maritime picture built by quilting together a variety of sources, including those that allow mapping ice boundaries in the polar regions and other oceanographic efforts, can result in greater maritime domain awareness and lead to more effective defenses from seaborne threats, as well as safer navigation for the world's merchant fleets.

The Navy continues to engage the Intelligence Community (IC) as it plans future acquisitions and considers commercial capabilities to help meet our Nation's ISR needs. The Navy is striving to foster a better understanding across the IC of the unique ISR requirements in the maritime domain, improving the ease with which Navy requirements can be factored into acquisition decisions and the probability they can be met, or partially met, in a highly competitive, cost-constrained environment. The Navy requirements are very different from land targets; in the open ocean, and especially in littoral areas, ships are constantly moving, requiring larger area coverage and more frequent revisits to maintain reliable tracks. The Navy continues to work toward greater U.S. and international collaboration using civil and commercial, as well as national security space systems, to gain increased persistence and area coverage, reduce cost, and improve global maritime domain awareness.

Navy continues to leverage its Tactical Exploitation of National Capabilities (TENCAP) effort as well as research labs to explore new methods for adapting existing systems to meet Navy requirements. Through TENCAP initiatives Navy has developed and fielded maritime-specific ISR capabilities at low cost, leveraging global Geospatial Intelligence and Signal Intelligence systems to enable a fused common operational picture. Efforts have resulted in improved onboard spacecraft sensor and ground processing, greater downlink bandwidth through advanced data compression, and enhanced geo-location techniques. Additionally, Navy, broader interagency and department collaboration, has fielded and transitioned capability that significantly enhances the indications and warning of adversary Unmanned Aircraft System activity, establishing a system baseline that can be adapted to meet evolving foreign unmanned system threats. Navy TENCAP, in partnership with the IC, DOD, and Services, is developing an integrated ISR and Cyber multi-source capability to fuse national intelligence system data with tactical unit collection within a single classified security domain. This initiative has the potential to unlock vast stores of operationally relevant data currently inaccessible to tactical users because of multiple security enclaves and related policies, proprietary industry designs, and organizational controls.

Commercial systems have collection capabilities well suited to support maritime surveillance that can also be used to fill collection gaps. These efforts are paying dividends, but more investment in research and development is needed. As budgets decline, it will be new collection modes, processing technologies, and exploitation strategies, combined with ensuring that future systems accommodate unique Navy maritime requirements, which will produce the timely, precise, and relevant information so vital to 21st century naval warfare.

CONCLUSION

The Navy continues to be heavily reliant upon space for SATCOM, PNT, MW, EM, and ISR information in order to enable swift and decisive decisionmaking in increasingly contested and denied environments. Growing global uncertainty, as well as the current fiscal environment, will continue to require the Navy to become more efficient in the use of available assets in order to maintain the level of effectiveness that the Nation expects. This will require continued vigilance to ensure that threats to the space constellations are continuously evaluated and that mitigations are in place to ensure forward-deployed commanders have the tools necessary to ensure mission success.

Mr. Chairman, thank you for the opportunity to share our efforts with you today. We look forward to answering any questions you and the subcommittee may have.

Senator UDALL. Thank you. Forgive me for an oversight. I should have properly introduced Secretary Loverro, who is the Deputy Assistant Secretary of Defense for Space Policy, and Dr. Zangardi, who is the Deputy Assistant Secretary of the Navy for Command, Control, Communications, Computers, Intelligence, Information Operations, and Space. That's quite a portfolio.

I now want to recognize a good friend of mine, General William L. Shelton, USAF, who is the Commander of the Air Force Space Command, based in Colorado, my home State. General Shelton, the floor is yours.

STATEMENT OF GEN. WILLIAM L. SHELTON, USAF, COMMANDER, AIR FORCE SPACE COMMAND

General SHELTON. Mr. Chairman, Senator Sessions, Senator Fischer, it is an honor to appear before you today as the Commander of Air Force Space Command. It is also my privilege to appear with these colleagues in the national security space business.

Since its inception a little over 30 years ago, Air Force Space Command has made significant progress in evolving and sustaining space capabilities to underpin operations across the spectrum of conflict.

We have established three major goals to ensure these foundational capabilities are available to the warfighter and to the Nation: (1) to provide assured full-spectrum space capabilities; (2) to develop highly skilled and innovative space professionals; and (3) to provide resilient, integrated systems that preserve operational advantage for the Nation.

Accomplishing this in an era of declining budgets, growing threats, and increasing requirements is no small challenge. We face a daunting new challenge, providing these foundational capabilities in an era of sequestration. In my command alone, I had to find $508 million in reductions for the remainder of fiscal year 2013. The chaos created by operation and maintenance account reductions this large in this short time period cannot be overstated. At the top of the list is the significant and justifiable angst of my civilian workforce facing the prospect of a 20 percent pay cut for the last 14 weeks of this fiscal year.

Despite our fiscal challenges, we will work together with our mission partners and with industry to find innovative approaches to providing vital space capability to the Nation.

I thank the committee for your steadfast support of Air Force Space Command and its people, and thank you, Mr. Chairman.

[The prepared statement of General Shelton follows:]

PREPARED STATEMENT BY GEN. WILLIAM L. SHELTON, USAF

INTRODUCTION

Mr. Chairman and Senator Sessions, it is an honor to appear before you and your committee today as the Commander of Air Force Space Command.

I have the distinct privilege of leading over 40,000 people who deliver our Nation's space and cyberspace capabilities around the world, 24 hours a day, 7 days a week. From the 14th and 24th Air Forces, to the Space and Missile Systems Center, to the entire breadth of this Command, we embody the fighting spirit, flexibility and ingenuity of the U.S. Air Force. Outstanding Airmen are the core of our team and I will take a moment to highlight a few individuals.

Major Kenneth Holmes spent 140 days deployed to Bagram Air Base, Afghanistan. During that deployment, his leadership and expertise enabled a Joint Task

Force to significantly disrupt thousands of hours of enemy communications, ultimately aiding in the capture or elimination of over 1,470 enemies, including 166 high-value individuals. In January 2013, Major Holmes was presented the Forrest S. McCartney National Defense Space Award in recognition of his ability to integrate space capabilities into the fight.

Captain Kathleen Sullivan, a flight test engineer at Buckley Air Force Base, Colorado, led the integration of the Space-Based Infrared System into live-fire Missile Defense tests. She incorporated next-generation missile warning data into the missile defense kill-chain during multiple test campaigns, testing capabilities that will better protect the United States and our allies. Captain Sullivan was also my command's nominee for the Air Force Lance P. Sijan Award, in recognition of her outstanding leadership.

Senior Airman Nicholas Hurt, a member of the 721st Security Forces Squadron, Cheyenne Mountain Air Force Station, CO, was responsible for helping secure Bagram Air Base, Afghanistan. During his deployment, he routinely led 13-person squads on outside-the-wire reconnaissance patrols, located and secured unidentified explosive ordnance and responded to indirect fire incidents. He was one of my Command's Outstanding Airmen of the Year and is now one of the Air Force's 12 Outstanding Airmen of the Year for 2012.

Major Holmes, Captain Sullivan, Senior Airman Hurt, and other members of the command bring foundational space and cyberspace capabilities to the Nation. It is imperative that the U.S. Armed Services operate effectively in space and cyberspace, as noted in the Secretary of Defense's January 2012 Sustaining U.S. Global Leadership: Priorities for 21st Century Defense strategic guidance. Additionally, the President's 2010 National Security Strategy states, the "space and cyberspace capabilities that power our daily lives and military operations are vulnerable to disruption and attack." We are mindful there are ever-changing threats to our systems and to our ability to operate effectively in space and cyberspace. Whether the threats originate from an adversary or are environmental or fiscal in nature, Air Force Space Command forces still have the day-to-day responsibility to conduct global operations in and through space and cyberspace, from peace through crisis and war, fulfilling tactical and strategic objectives on local and global scales.

Since its inception just over 30 years ago, the Command has made tremendous progress in evolving and sustaining space and cyberspace capabilities. In an era of declining budgets, growing threats and increasing requirements, the Command continues providing cost-effective, foundational space and cyberspace capabilities. I have three goals to ensure those foundational capabilities are available to the warfighter and the Nation: to provide assured full spectrum space and cyber capabilities, to develop highly-skilled and innovative space and cyberspace professionals and to provide resilient, integrated systems that preserve operational advantage. This statement is organized around these goals and the Command's national security space activities to fulfill them.

PROVIDE ASSURED FULL SPECTRUM SPACE CAPABILITIES

Space capabilities are critical to the Joint Force Commander's ability to deter aggression, win America's wars and conduct other missions such as humanitarian and disaster relief operations. In addition, the U.S. and global economies rely on space systems to enable vital activities such as navigation, commerce and agriculture. As the Air Force's space superiority lead, I am responsible for organizing, training and equipping our space capabilities. In the current fiscal climate, we are managing increased risks across the enterprise while modernizing, sustaining and acquiring space capabilities, consistent with national, Department of Defense, Joint and Air Force priorities. We have made significant strides in providing gamechanging effects to the warfighter and I would submit that, under the strong leadership of Lieutenant General Ellen Pawlikowski, Commander of our Space and Missile Systems Center, we have turned the corner on space acquisition, delivering cost-effective capabilities. Within this context, I would like to highlight some of our space capabilities that are critical to our Nation's security.

Nuclear, Survivable; Protected Tactical and Unprotected Communications

The 2011 National Military Strategy notes that the interlinked domains of air, space, and cyberspace are essential to the Joint forces' ability to deter and defeat aggression. Our communication satellites link the domains by providing nuclear-survivable communications for the President and national leaders as well as protected, tactical and unprotected communications to the warfighter.

The Advanced Extremely High Frequency Satellite Program and its secure communications capability is one of those protected, vital links. We launched the second satellite in 2012 and the third satellite is on track for a late 2013 launch. We also

continue to execute our near-term Space Modernization Initiative investment strategy, establishing a competitive industrial base and demonstrating fundamental elements for a resilient, next-generation, protected military satellite communications capability.

The Family of Beyond-Line-of-Sight Terminals will provide nuclear survivable communications to airborne and ground command posts, manned bombers and manned intelligence, surveillance and reconnaissance aircraft using the Milstar and Advanced Extremely High Frequency constellations. In 2012, to reduce cost risk to the Government, the current terminal development contract was converted from cost plus to fixed price, and competition was injected into the program with the award of an alternate source development contract. More recently, the program office released a Production Request for Proposal for the limited competition of both an Airborne Wideband Terminal and a Command Post Terminal with a planned contract award the first quarter of fiscal year 2014 and delivery of an initial Command Post Terminal with Presidential, National and Voice Conferencing capability in fiscal year 2015.

The Wideband Global Satellite (WGS) system provides high-capacity communications to the Department of Defense, the White House Communications Agency, the Department of State and an increasing number of international partners. We launched and tested the fourth satellite in 2012 and it is providing critical wideband communications to U.S. and coalition forces in U.S. Central Command and U.S. Pacific Command. The fifth and sixth satellites are on track for launch during fiscal year 2013 and are expected to be operational in mid fiscal year 2013 and early fiscal year 2014 respectively. Once WGS–5 becomes operational, the constellation will be postured to provide worldwide coverage.

To support our long-term investment strategy, we are conducting studies to determine the optimal mix of Department of Defense and commercial solutions to meet the growing wideband demand in the most affordable and resilient manner.

Launch Detection and Missile Tracking

Strategic missile warning is critical to the Nation's survival. Ballistic missiles pose a significant threat to the United States, our deployed forces, allies and coalition partners. The command supports the strategic and tactical missile warning missions by providing both space- and ground-based sensors.

The Space Based Infrared System (SBIRS) program, along with the legacy Defense Support Program satellites, provide advanced early warning of missile threats, allowing our Joint warfighters to take swift and appropriate actions. In September 2012, the first geosynchronous orbit SBIRS (GEO–1) began required operational testing. While the mission data is exceeding expectations, we uncovered an unexpected problem which will be resolved shortly with a software update. The fact that the fix is software only gave us the necessary confidence to launch GEO–2 on March 19, 2013.

Ground-based radars deliver missile warning and missile defense capabilities to counter current and emerging missile threats. We are executing several initiatives to modernize these radars. In addition, we are working several Upgraded Early Warning Radar initiatives with the Missile Defense Agency to improve the radars' ability to provide fire control data for missile defense assets. These initiatives will significantly improve our early warning capabilities by updating the original 1950's technology and standardizing our operations and sustainment baselines.

Positioning, Navigation, and Timing

This has been another successful year for Air Force Positioning, Navigation and Timing capabilities—ensuring the continued health and resilience of the constellation: legacy Global Position System (GPS) IIAs, current generation GPS IIFs and next generation GPS IIIs. Captain Jacob Hempen, a project engineer at our Space and Missile Systems Center, modified satellite battery charging procedures, significantly increasing GPS IIA constellation total battery life by 20 years. Under the leadership of Major Jason Smesny, also from the Space and Missile Systems Center, a combined Air Force and contractor team completed operational checkout of the third GPS IIF 4 days ahead of schedule. It became part of the operational constellation on November 13, 2012. Between March 2012 and March 2013, we completed production of five GPS IIF satellites, and we will complete production of the final GPS IIF satellite this year, for a total production run of 12 GPS IIF satellites. We plan to launch the fourth GPS IIF in May 2013 and the fifth, sixth, and seventh satellites during fiscal year 2014.

On GPS III, we heeded the lessons learned of the last 2 decades in terms of management, process rigor, technical discipline and programming to create both a realistic schedule and cost for delivery. As a result, the program team continues to re-

duce defects, test time and build time while driving down recurring cost. This approach includes the integration of a non-flight satellite testbed space vehicle used for production risk reduction this fiscal year. The team also delivered the propulsion subsystem for the first flight vehicle and completed its first exercise demonstrating space vehicle to ground segment integration. Looking forward to the production phase, we are also converting the unexercised cost plus space vehicle contract options to fixed price incentive contract options. As a result, GPS III continues to move forward and we fully expect that it will stay within the cost bounds we established in 2008. We are steadfast in the pursuit of affordability and effectiveness initiatives, including examination of alternative architectures as well as exploring dual-launch opportunities to lower costs of launching our next-generation satellites.

The GPS Next Generation Operational Control System, the modernized command and control system, will provide control of GPS IIA, IIF and III, satellites and signals, to include the new Military Code (M-code). The combination of GPS III capabilities, such as M-code, along with modernized user equipment and the new command and control system, will provide Joint warfighters vital capability in challenging environments, such as GPS jamming, as well as robust information assurance. It will ensure the use of the modernized signals by the United States and its allies for military purposes.

Space Situational Awareness

Space situational awareness underpins the entire spectrum of space activities, and our focus is on providing forces and capabilities to U.S. Strategic Command (STRATCOM) to detect, track, identify, and characterize human-made objects which orbit the Earth. Our efforts contribute to the collaborative, multi-agency endeavor required to ensure comprehensive space situational awareness for the Nation.

Air Force Space Command presents space forces and capabilities to STRATCOM through the 14th Air Force, under the command of Lieutenant General Susan Helms. She is dual-hatted as Commander, Joint Functional Component Command for Space (JFCC SPACE), and therefore is responsible for executing STRATCOM's space operations. JFCC SPACE's Joint Space Operations Center (JSpOC) is the avenue through which JFCC SPACE commands and controls space forces and it is the epicenter of the space situational awareness mission. The JSpOC is also the means by which JFCC SPACE coordinates space situational awareness with other agencies.

To support national security space operations in an increasingly challenged environment, the JSpOC collects and processes data from a worldwide network of radar and optical sensors, as well as a dedicated space surveillance satellite. Each day the JSpOC creates and disseminates over 200,000 sensor taskings, which result in nearly 500,000 observations for processing. JSpOC operators use this data to maintain a very accurate catalog for more than 23,000 objects and to perform over 1,000 satellite collision avoidance screenings daily. These operations form the basis of the United States' space situational awareness capability, which is then shared with other operators in the national security, civil and commercial sector of space operations.

The Space Defense Operations Center (SPADOC) is the system of record for cataloging space objects and debris. While essential to safe passage and navigation in space, this system was designed in the 1980s, fielded in the early 1990s, and is at its capacity limits and past its originally projected end-of-life. It is vital to our national security space capabilities that we transition from our current surveillance and catalog maintenance-focused methodology, which limited us to performing forensic analysis during and after a space event (e.g., a collision, break-up or anti-satellite test), to a more holistic space situational awareness capability. We are building the capacity to predict events in space to enable actionable, situational awareness to our space operators, Joint warfighters, allies and other mission partners. This transition requires fielding the next generation system, the JSpOC Mission System (JMS). With its open, service-oriented architecture, JMS will supply the automation necessary to make better use of the tremendous volume of available sensor data. It will allow improved integration of intelligence data and innovative changes to how we use our systems, thereby providing a more complete, real-time and predictive picture of activity in the space domain.

JMS does not just replace SPADOC, it establishes a baseline for integrating new command and control capabilities in support of the Commander, JFCC SPACE, and Combatant Commanders alike. We achieved a major milestone by completing the operational utility evaluation for the first increment and operational testing was completed on December 13, 2012. It is projected to achieve Initial Operational Capability this Spring.

On November 14, 2012, the U.S. Secretary of Defense and the Australian Minister of Defence signed a Memorandum of Understanding to relocate an Air Force C-band

radar on Antigua to Australia. This action represents the next phase in implementing the 2010 U.S. and Australia Space Situational Awareness Partnership.

When the Space Fence program replaces the existing Air Force Space Surveillance System, it will represent an order of magnitude increase in the Nation's Space Situational Awareness capability in Low and Medium Earth Orbits. The program has an approved acquisition strategy that reduces cost, adds much-needed capability, and meets the prescribed initial operational capability timeline. We have selected the Kwajalein Atoll in the Marshall Islands as the first site for the new Space Fence, improving our ability to track objects in all low-earth orbits, and particularly providing unique coverage of low inclination orbits.

The Space Based Space Surveillance satellite, launched in 2010, provides timely, continuous optical surveillance of deep space objects. I declared initial operational capability August 15, 2012, and the Commander of STRATCOM accepted the satellite for operational use on September 10, 2012. We continue to study options for a follow-on program to this vital capability.

Defensive Space Control

The Rapid Attack, Identification, Detection and Reporting System Block 10 program delivers global communication satellite signal interference detection and geolocation capabilities. The current operational prototype provides geo-location on over 500 electromagnetic interference events per month in support of U.S. Pacific Command and U.S. Central Command. Adversaries are getting more sophisticated and we are responding. By 2014, we plan to have global capability to identify and characterize electromagnetic interference and geo-locate electromagnetic interference sources.

Terrestrial Environmental Monitoring

We will extend a half century of Defense Meteorological Satellite Program (DMSP) unique weather monitoring capabilities by launching the final two satellites in the program. DMSP–19 is scheduled to launch in March 2014, and we expect to operate the satellite into 2020. We continue to store and maintain DMSP–20 for a launch on demand. The Joint Requirements Oversight Council has identified potential gaps in meteorological coverage when DMSP reaches its end-of-life in the 2025 timeframe. An Analysis of Alternatives is being conducted to study follow-on options, such as international partnerships, hosted payloads and a new satellite, to continue meteorological support to warfighters in the most cost-effective manner.

Assured Space Access/Spacelift

The 45th Space Wing at Patrick Air Force Base, Florida, and the 30th Space Wing at Vandenberg Air Force Base, CA, supported a combined 14 commercial and Government launches in 2012 extending the record-breaking streak to 57 successful Evolved Expendable Launch Vehicle launches since 2002. The Under Secretary of Defense for Acquisition, Technology, and Logistics authorized the Air Force to negotiate with the current launch provider, United Launch Alliance, to procure a block buy of launch vehicles while providing an opportunity for new entrant contract awards as early as fiscal year 2015. Lieutenant Colonel Tobin Cavallari, from the Space and Missile Systems Center, is implementing this acquisition strategy to provide competition and to save over $1 billion.

In the area of new entrants, we have made significant progress toward increasing competition for national security space launches. Jointly with National Aeronautics and Space Administration and the National Reconnaissance Office, we formalized new entrant certification criteria. The Air Force subsequently developed a guide providing a process for certifying a new entrant to launch National Security missions. Additionally, two launch service task orders were awarded to a new entrant under the Orbital/Suborbital Program-3 to provide launch services for the Deep Space Climate Observatory mission and the Space Test Program-2 mission.

Satellite Operations

The Air Force Satellite Control Network, the Command's satellite command and control capability, enables critical missile warning, surveillance, weather and communications for our Joint warfighters. In 2012, Joint and allied space professionals used the network to conduct an average of 427 satellite contacts per day with a 99.37 percent contact success rate. They supported 13 National Security Space launches and 19 space vehicle emergencies. On September 21, 2012 they accomplished a record 527 satellite contacts in a single day. Over the last 2 years the network successfully conducted over 316,000 supports—this was the busiest 2 years in its 50-year operational history.

In addition to this busy operations tempo, we upgraded the legacy electronics for the remote tracking station at Guam, modernizing our satellite control capability in

the Pacific. Similar upgrades are in progress at the Hawaii remote tracking station, and upgrades will begin in 2013 at the New Hampshire remote tracking station. In the future, we will transition to a modern, secure internet protocol-based architecture, and we are examining the potential of commercial augmentation of our network.

U.S. Nuclear Detonation Detection System

In a Joint effort with the Department of Energy and Department of State, many Air Force satellites have hosted sensors supporting detection, location and reporting of nuclear detonations in support of warfighter needs and treaty verification requirements. We will continue to support our partners, and I am confident we can jointly determine how to maximize our limited resources while still satisfying the requirements for these sensors.

FIELD RESILIENT, INTEGRATED SYSTEMS THAT PRESERVE THE OPERATIONAL ADVANTAGE

Resilient Architectures

Our satellites provide a strategic advantage for the United States, and as such, we must consider the vulnerabilities and resilience of our constellations. My staff at Headquarters Air Force Space Command, alongside the team at the Space and Missile Systems Center, is leading efforts at balancing resilience with affordability. They are examining disaggregated concepts and evaluating options associated with separating tactical and strategic capability in the missile warning and protected communications mission areas. We are also evaluating constructs to utilize hosted payload and commercial services, as well as methods to on-ramp essential technology improvements to our existing architectures. For example, we are learning lessons on how to make hosted payloads a realistic option through the Commercially Hosted InfraRed Payload Program, which is a pathfinder asset on orbit today. Beyond the necessity of finding efficiencies and cost savings, we may very well find that disaggregated or dispersed constellations of satellites will yield greater survivability, robustness and resilience in light of environmental and adversarial threats.

Electromagnetic Spectrum

Peacetime and warfighting operations are enabled via employment of a wide variety of advanced wireless systems, including satellites, aircraft, remotely piloted vehicles, land mobile radios, radars, data links and precision guided munitions. The Air Force Spectrum Management Office, led by Colonel Donald Reese, is tasked with preserving electromagnetic spectrum access for Air Force and selected Department of Defense activities and systems. Their efforts have been crucial to our ability to provide support using a variety of airborne and space-borne platforms to users across the globe.

The global and economic demand for this finite resource is continually increasing. In this environment, we strive to assure access for spectrum-dependent military systems and to maintain over 30,000 frequency assignments essential to Service and Joint operations, testing and training. We also support efforts to implement Presidential direction to identify available spectrum for broadband wireless services while protecting vital Air Force capabilities. We are working closely with other Federal agencies to implement actions to protect and advance U.S. and Air Force spectrum interests.

PROVIDE HIGHLY-SKILLED AND INNOVATIVE SPACE AND CYBERSPACE PROFESSIONALS

Air Force space and cyberspace professionals are the backbone of our success. They provide expertise and innovation for current and expanding missions. To ensure deliberate development of this expertise, the Command manages the Air Force Space and Cyberspace Professional Development Programs for all Air Force specialties. These programs ensure we are providing a well-educated space and cyberspace cadre to units worldwide.

A highlight of my year was presiding over the opening of the Moorman Space Education and Training Center at Peterson Air Force Base, CO. On September, 13, 2012, the Center was dedicated in honor of General (Retired) Thomas S. Moorman, Jr., a champion of space professional development. The opening of this center enhances the training provided to the more than 2,500 space professional students from across the Services and allied nations each year. These students receive specialized space system training and professional continuing education at the Advanced Space Operations School and the National Security Space Institute.

Given the technical nature of the space and cyberspace domains, it is essential we have Science, Technology, Engineering, and Math (STEM)-educated people in our units. We are strengthening our education requirements in space and cyber-

space, but we realize we compete with decreasing numbers of STEM graduates, a national security problem in its broadest sense. Therefore, we are actively promoting the benefits of STEM degrees, starting with elementary school and continuing through the entire educational process. As an example, our cyberspace professionals in 24th Air Force, under the leadership of their commander, Maj. Gen. Suzanne Vautrinot, mentor local teams competing in CyberPatriot, a national high school cyber defense competition created by the Air Force Association. In Colorado, Peterson Air Force Base and Buckley Air Force Base have both applied for acceptance into the STARBASE program, a Department of Defense program exposing youth to technological environments and appropriate role models. We believe our investment today in young people is a cornerstone for our success in the future.

CONCLUSION

The men and women of Air Force Space Command accomplish our mission through a combination of innovation, passion and courage. They are the core of America's space and cyberspace team operating in domains that span the globe. Our single focus endures: providing the best capability possible to ensure success on the battlefield. The joint warfighter demands it, and the Nation expects nothing less, and therefore, Air Force Space Command remains steadfast in delivering game-changing space and cyberspace forces.

However, we face a new, daunting challenge: providing these foundational capabilities in an environment of sequestration. The very rigid mechanics of the Budget Control Act of 2011 force us into corners, rather than giving us needed flexibility to accommodate current and future budget reductions. In my Command alone, I had to find $508 million in fiscal year 2013 reductions beginning March 1, 2013. The chaos created in my Command by operations and maintenance reductions this large, in this short time period, can't be overstated. It starts with the justifiable angst of my civilian workforce, facing the prospect of a significant pay cut starting in June for the remainder of the fiscal year. AFSPC Headquarters support contracts have been reduced by 50 percent, which means lost jobs and reduced staff technical expertise. Operationally, two missile warning radars will not operate at full capacity for the rest of the year, one of which is key to our missile defenses. A unique space surveillance system's coverage will be reduced by one-third, compounding the loss of space surveillance data normally collected by the aforementioned radars we've been forced to scale back. These are not operational decisions arrived at lightly; the so-called "easy" reductions were taken in previous years. We've minimized overall operational impacts as much as possible, but the rigidity in the law dictates we must cut every appropriated line item in our budget, severely restricting our trade space. I strongly ask for your support for the reprogramming actions that will be needed to enable smarter decisions.

I am truly privileged to lead this great Command and I appreciate the opportunity to represent Air Force Space Command before this committee.

Senator UDALL. Thank you, General Shelton.

We will next hear from Lieutenant General Richard P. Formica, Commander of U.S. Army Space and Missile Defense Command, USA, and Army Forces Strategic Command General, thank you for being here today.

Senator SESSIONS. Mr. Chairman, could I just add my welcome to General Formica? He does a great job in Huntsville at the Space and Missile Defense Command, and we are proud of his work. We look forward to hearing from 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. Thank you, Senator.

Chairman Udall, Ranking Member Sessions, Senator Fischer, it is an honor and a privilege for me to appear here as the Commander of Space and Missile Defense Command and as a soldier in the U.S. Army. I want to thank you for your ongoing support of our soldiers, civilians, and families.

Today, I will reinforce the Army's enduring need of space capabilities, recognizing that they come during the present environment of declining resources. Space capabilities are and will remain critical to the Army as it conducts unified land operations, and they have been appropriately prioritized by headquarters Department of the Army. Nonetheless, fiscal uncertainties resulting from sequestration will impact our ability to provide space-based capabilities to the warfighter. It has also impacted our professional civilian workforce.

Space is essential to the Army. It is the ultimate high ground. Within DOD, the Army is the biggest user of space capabilities and is also a provider of space-based capabilities.

Our command at U.S. Army Space and Missile Defense Command contributes space capabilities to the joint force through three core tasks: (1) to provide trained and ready space and missile defense forces and capabilities today; (2) to build future space and missile defense forces and capabilities for tomorrow; and (3) to provide space missile defense and other related technologies like the nanosat technology that you referred to in your opening statement, Mr. Chairman, for the day after tomorrow.

Your committee's continued support of our Army and its space program is essential in maintaining and improving our space capabilities and the development of our cadre of space professionals.

I look forward to addressing any of your questions. Army Strong!

[The prepared statement of General Formica follows:]

PREAPRED STATEMENT BY LTG RICHARD P. FORMICA, USA

INTRODUCTION

Mr. Chairman, Ranking Member Sessions, and distinguished members of the subcommittee, thank you for your continued support of our soldiers, civilians, and families. This marks my third appearance before this subcommittee; I appreciate the opportunity to testify again. Thank you for being strong advocates of the Army and the key capabilities that space affords our warfighters. Your past and future support is important as we pursue joint efforts to provide critical space capabilities for our Nation, our fighting forces, and our allies.

My role has not changed since my previous subcommittee appearances. I still have three distinct responsibilities in support of our warfighters. First, as the Commander of the U.S. Army Space and Missile Defense Command, I have Title 10 responsibilities to organize, man, train, and equip space and missile defense forces for the Army. Second, I am the Army Service Component Commander (ASCC) to the U.S. Strategic Command (STRATCOM), or Commander, Army Forces Strategic Command. I am responsible for planning, integrating, and coordinating Army space and missile defense forces and capabilities in support of STRATCOM missions. Third, I serve as the Commander of STRATCOM's Joint Functional Component Command for Integrated Missile Defense (JFCC IMD), enabling me to leverage the capabilities and skill sets of the U.S. Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) in a broader, joint environment.

In my role here today as the Commander of USASMDC/ARSTRAT, I am again honored to testify with this distinguished panel of witnesses—all providers of critical space capabilities to the warfighter and essential contributors to the Nation's continued advances to effectively leverage the capabilities derived from space and space-based assets.

Within the Army, space operations and space-related activities are pursued as an enterprise. While not the exclusive domain of USASMDC/ARSTRAT, the Army has assigned USASMDC/ARSTRAT as the Army's proponent for space. In this role, we coordinate with the other members of the Army space enterprise, to include the Army intelligence, signal, and geospatial communities. We are increasingly engaged across the broader Army community to ensure space capabilities are maximized and integrated across our entire force and that potential vulnerabilities to our systems

are mitigated to the greatest extent possible. We also collaborate with STRATCOM and its Joint Functional Component Command for Space (JFCC Space) and other members of the joint community to provide trained and ready space forces, space-based, and space enabled ground-based capabilities to the warfighter. Additionally, we work closely with acquisition developers in the other Services to ensure the enhancement of systems that provide the best capabilities for ground forces.

Within the space arena, USASMDC/ARSTRAT continues to strive to provide space capabilities through our three core tasks:

- To provide trained and ready space forces and capabilities to the warfighter and the Nation—our operations function that addresses today's requirements.
- To build future space forces—our capability development function that is responsible for meeting tomorrow's requirements.
- To research, test, and integrate space and space-related technologies—our materiel development function that aims to advance the Army's and warfighter's use of space the day-after-tomorrow.

Providing Army Space Capabilities—Today, Tomorrow, and the Day-After-Tomorrow

During my 2011 appearance before this subcommittee, my desire was threefold: 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. Last year, I sought to further address the absolute necessity of space-based capabilities for our warfighters and to expand upon the above three core space tasks that our soldiers, civilians, and contractors diligently execute each and every day. This year, I would like to impress upon the subcommittee the need to ensure our space capabilities are maintained, if not further enhanced, despite the present environment of declining resources and increasing threats. We are facing the impacts of the current fiscal situation on our budget. The Army has our highest priority requirements. We will continue to monitor the impact on readiness as a result of sequestration.

THE WORKFORCE—OUR GREATEST ASSET

At USASMDC/ARSTRAT, as is the case within all the Army, our people are our most enduring strength. The soldiers, civilians, and contractors at USASMDC/ARSTRAT support the Army and joint warfighter each and every day, both those stationed on the homeland and those deployed overseas. Within our command, we strive to maintain a professional cadre of space professionals to support our Army.

The ongoing fiscal uncertainties and the impacts of sequestration to the USASMDC/ARSTRAT Civilian workforce continue to cause concern for me and angst in the workforce. I have three concerns. First, I am concerned about the impact of a potential furlough, which has caused angst, impacted morale, and is expected to place personal hardships on much of the workforce. Second, the civilian hiring freeze is creating vacancies in the workforce. This impacts our ability to build our bench and will have longer-term impacts on the ability to provide space capabilities to the warfighter. Third, the elimination of our temporary and term employees, some of which are our future engineers, is impacting the next generation of Civilian professionals. We will work to mitigate these issues and reduce their impact on our ability to provide capabilities to the warfighter.

RELIANCE ON SPACE-BASED CAPABILITIES

As I reported during previous appearances, 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. The Army is dependent on space capabilities to execute unified land operations in support of the combatant commanders' objectives. Army space forces contribute to the joint and Army's ability to be adaptive, versatile, and agile to meet tomorrow's security challenges. Simply put, space capabilities are critical elements of the Army's ability to see, shoot, move, and communicate.

The Army is the largest user of space-enabled capabilities within the DOD. Our ability to achieve operational adaptability and land dominance depends on the benefits derived from key assets in space. Integrating space capabilities enables commanders, down to the lowest echelon, to conduct unified land operations through decisive action and operational adaptability.

The Army's Operating Concept identifies six warfighting functions that contribute to operational adaptability: mission command, movement and maneuver, intelligence, protection, fires, and sustainment. Space-based capabilities leveraged and

employed across the national space enterprise enable each of these warfighting functions. Virtually every Army operation relies on space capabilities to enhance the effectiveness of our force.

Army Space Capabilities are Combat Multipliers that Enable All Six Warfighting Functions

When combined with other capabilities, space systems allow Joint Forces to see the battlefield with clarity, navigate with accuracy, strike with precision, communicate with certainty, and operate with assurance. Dependence on space as a force multiplier will continue to grow for the Army of 2020 and beyond, especially in an era of tight fiscal resources, a smaller force structure, and a potentially reduced forward presence. The bottom line is that we, as an Army, depend on space capabilities in everything we do. Retaining our global space superiority is a military imperative—there is no going back.

SPACE IN SUPPORT OF ARMY WARFIGHTING FUNCTIONS

While the Army is the largest DOD user of space, we are also a provider of space-based capabilities. There are five space force enhancement mission areas: satellite communications (SATCOM); position, navigation, and timing (PNT); intelligence, surveillance, and reconnaissance (ISR); missile warning (MW); and environmental monitoring. Commanders and soldiers leverage these space force enhancement capabilities to conduct warfighting functions. They are critical enablers to our ability to plan, communicate, navigate, and maintain battlefield situational awareness; target the enemy; provide missile warning; and protect and sustain our forces. Army and joint forces require assured access to space capabilities and, when required, have the ability to deny our adversaries the same space-based capabilities.

Joint interdependence is achieved through the deliberate reliance on the capabilities of one or more Service elements to maximize effectiveness while minimizing vulnerabilities. As the DOD Executive Agent for Space, the Secretary of the Air Force is responsible for leading the development, production, support, and execution of military space operations. STRATCOM is the combatant command headquarters responsible for planning and advocating for space capabilities for the warfighter. The Army continues to utilize national, joint, and commercial systems for additional capabilities while pursuing cross-domain solutions that support Unified Land Operations. The Army must continue to influence joint requirements and new solutions that provide compatible space capabilities seamlessly integrated in support of our warfighting functions. Finally, we must actively engage in focused experimentation, smart developmental test and evaluation, and timely military utility demonstrations to take advantage of dynamic technological advances in space.

"Modern Armed Forces Cannot Conduct High-Tempo, Effective Operations Without ... Assured Access to Cyberspace and Space."—Defense Strategic Guidance, January 2012

In 2014, in this era of tight fiscal constraints, the Army plans to sustain the investment made in systems and people in pursuing space and space-related activities. As outlined in the Army's Space Strategy, our plans are to continue to evolve from a position of simply exploiting strategic space-based capabilities to one where the Army is fully engaged in the planning, development, and use of theater-focused operational and tactical space applications.

TODAY'S OPERATIONS—PROVIDE TRAINED AND READY SPACE FORCES AND CAPABILITIES

Each day, USASMDC/ARSTRAT provides trained and ready space forces and capabilities to combatant commanders and the warfighter. Within our 1st Space Brigade, approximately 1,000 soldiers and civilians, forward-deployed, forward-stationed, or serving at home, provide space capabilities via access to space-based products and services that are essential in all phases of combat operations. The Brigade, a multi-component organization comprised of Active, National Guard, and U.S. Army Reserve soldiers, provides flexible, reliable, and tailored support to combatant commanders and warfighters by conducting continuous global space support, space control, and space force enhancement operations. The Brigade's three battalions provide satellite communications, space operations, theater missile warning, and forward-deployed space support teams.

Within the Army, space professional personnel management is the responsibility of USASMDC/ARSTRAT. We serve as the Army's proponent and developer of training for space professionals and provide training assistance for Space Enabler indentified positions. Our Army Space Personnel Development Office (ASPDO) develops policies, procedures, and metrics for the Army Space Cadre and executes the life-cycle management functions of Functional Area (FA) 40 Space Operations Offi-

cers. The Army's Space Cadre, utilizing FA 40s as its foundation, is comprised of over 2,800 soldiers and civilians. The Space Cadre and Space Enablers consist of soldiers and civilians from multiple branches, career fields, disciplines, and functional areas.

> "Access to these capabilities is achieved through the Warfighting Functions by Soldiers and a Space Cadre . . ."—Army Space Operations White Paper, April 2012

Today, there are approximately 400 multi-component FA 40s serving Army and joint commands and organizations across all echelons of command—tactical, operational, and strategic. These Space Operations Officers, along with members of the Army's Space Cadre, directly influence the execution of strategic operations in support of operational and tactical level ground maneuver forces. Their principal duties include planning, developing, acquiring, integrating, and operating space forces, systems, concepts, applications, and capabilities in any element of the DOD space mission areas. In general, they bring our Nation's space capabilities to combatant commanders to help them achieve their strategic, operational, and tactical objectives. During the past year, USASMDC/ARSTRAT space professionals have supported 16 major exercises, 3 mission rehearsal exercises for deploying units in support of Operation Enduring Freedom, and 17 other named operations.

An overview of some of the critical space capabilities provided by Army space professionals is highlighted below.

Army Space Support Teams:

The Army deploys specialized Army Space Support Teams to support Army commanders, other Services, joint task forces, and multinational forces. The teams, which have a continuous deployed presence in the Afghanistan theater, provide space-based products and services to commanders and warfighters. 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. Over the past year, USASMDC/ARSTRAT deployed eight Army Space Support Teams and Commercial Imagery Teams to the U.S. Central Command's area of operation. Since the era of persistent conflict began, we have deployed teams on 78 occasions. In summary, these teams bring tailored products and capabilities that meet critical theater commander's needs.

> The Army "requires access to space capabilities to exercise effective mission command and support combatant commanders."—Army Capstone Concept, December 2012

Satellite Communications:

Our role in satellite communications (SATCOM) is to link tactical warfighter networks to the DOD Information Network primarily through the successful execution of the following tasks:

- Conducting payload operations and transmission control of the Defense Satellite Communications (DSCS) and Wideband Global SATCOM System (WGS) constellations. Transmission control for more than 97 percent of the DOD-owned SATCOM bandwidth is provided by Army operators controlling the payloads on these satellites.
- Serving as the consolidated SATCOM System Expert for the DOD narrowband and wideband SATCOM constellations which includes the DSCS, the WGS, the Mobile User Objective System (MUOS), the Ultra High Frequency SATCOM (UHF), and the Fleet Satellite Communications System. As the SATCOM System Expert for MUOS, the Army is responsible for DOD's use of our next generation tactical system which will transform tactical SATCOM from radios into secure cellular networked communication tools. Additionally, the Army has a significant role and assigned responsibilities in DOD's expanding use of military satellite communications on the WGS through a number of growing programs and initiatives. The Army is also the operational lead for multiple WGS international partnerships.
- Manning and operating the Wideband Satellite Communications Operations Centers (WSOCs) and the Regional Satellite Communications Support Centers (RSSCs). The satellite communications missions of the DSCS and the WGS are performed by the 1st Space Brigade's 53rd Signal Battalion and Department of the Army Civilians utilizing the capabilities of the globally located WSOCs and RSSCs. Over the past year, we completed necessary modernization and replacement of aging antennas and terminal equipment of two WSOCs—one in Hawaii and the other in Maryland. Mod-

ernization and equipment replacement was required so that the centers were compatible with the fleet of new and expanding WGS assets being deployed by the Air Force. Construction of the final WSOC in Germany has been delayed while resolution of a permit issue is pursued with the host country. We now project construction to begin late this calendar year.

Friendly Force Tracking:

Friendly force tracking (FFT) systems support situational awareness enroute to and throughout areas of operation. Joint and Army forces require precise position, navigation, and timing (PNT) information to enable confident, decisive maneuver by both ground and air assets. Accurate PNT data is also required for increased accuracy for weapons systems and precision munitions. The DOD's Friendly Force Tracking Mission Management Center, operated by USASMDC/ARSTRAT from Peterson Air Force Base, CO, interprets more than one and a half million location tracks a day to provide a common operating picture to command posts and operations centers. This capability, performed on behalf of STRATCOM, is an essential worldwide enabler to both military and other government agencies.

"Future forces require the ability to conduct integrated FFT operations that include joint forces and a wide array of unified action partners."—Army Space Operations White Paper, April 2012

Ballistic Missile Early Warning:

Early warning is a key component of the indications and warning for missile defense. Army forces need assured, accurate, and timely missile warning launch location, in-flight position, and predicted impact area data. 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. Our JTAGS Detachments are forward-stationed across the globe, providing 24/7/365 dedicated and assured missile warning to theater level commanders.

Geospatial Intelligence (GEOINT) Support:

USASMDC/ARSTRAT, as a member of the Army's intelligence community, provides geospatial intelligence production in direct support of the combatant commands, as an operational element of the Army National-To-Theater Program and member of the National System for Geospatial Intelligence. 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. Additionally, they aid in the exploration of emerging spectral system technologies and in transitioning new capabilities to the warfighter. A few of the recent operational imagery support services provided by our GEOINT professionals include assistance to U.S. Northern Command during last summer's Colorado Springs fires and support to U.S. Army North in the intelligence training provided to the Mexican Army. Since my last appearance before this subcommittee, our GEOINT professionals were recognized by the Defense Intelligence Agency for their outstanding homeland border security support over the past 5 years.

Operations Reach-back Support and Services:

Our Colorado Springs, Colorado Operations Center continues to provide daily reach-back support for our space experts deployed throughout the operational force and enables 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 Programs Office, under the direction of the assistant Secretary of the Army for Acquisition, Logistics, and Technology, is the Army's focal point for the exploitation of national intelligence, surveillance, and reconnaissance assets and products through the Tactical Exploitation of National Capabilities program. The Army continues to be fully integrated into the National Reconnaissance Office and the broader Intelligence Community.

Strategic Space Surveillance:

The Army also operates facilities and assets that are of utmost importance to protecting the Nation's use of space. The U.S. Army Kwajalein Atoll/Reagan Test Site, located in the Marshall Islands, is a national asset that provides unique radars and sensors that contribute to STRATCOM's space situational awareness mission, enabling protection of the Nation's manned and unmanned space assets. This strategic

site also serves as a critical asset for ballistic missile readiness testing, ballistic missile defense testing, and is ideally located to provide equatorial launch benefits.

ADDRESSING TOMORROW'S REQUIREMENTS—BUILDING FUTURE SPACE FORCES

Over the past 2 decades, Army operations have transitioned from being "supported" by space capabilities to being truly "enabled" by them—space capabilities are an integral part in conducting military operations. Military and civilian space technology has dramatically improved access, processing, and dissemination of data collected by space-based capabilities. To ensure our continued access to space-based capabilities, we must continue active participation in defining space-related requirements. These identified needs equip us to develop and mature Army and joint force structure and concepts of operations in sync with the deployment of capabilities, thereby enabling our forces to conduct tomorrow's full range of military operations. Assuring access to space is our focus—ensuring 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 continue to make certain that our Army does not face a day without space and space-related capabilities and that the Army is prepared to conduct operations in a space-degraded environment.

As Land Force Structure is Reduced, Strategic Enablers Such as Space and Cyber Become More Important

In our second core task of building space forces for tomorrow, we use our capability development function to meet future space requirements. We continue to use both established and emerging processes to document our space-based needs and pursue validation of Army, joint, and coalition requirements. This regimented approach helps ensure limited resources are applied where warfighter operational utility is most effectively served. The approach enhances our pursuit and development of necessary capabilities across Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities (DOTMLPF) domains to mitigate threats and vulnerabilities while sustaining land force operations. In addition to conducting and evaluating experiments, war games, studies, and analysis, our battle lab develops and validates concepts leading to the space related DOTMLPF alternatives and solutions.

Preparing Today's Warfighter for the Challenges of Tomorrow

In 2011, the Chief of Staff of the Army approved the Army's Space Strategic Plan. This document, shaped by national level guidance such as the National Space Policy and the National Security Space Strategy, outlines the Army's space enterprise path for strategic planning, programming, and resourcing. In April 2012, the Army Space White Paper was published—it serves as an integrated implementation plan of the Army's Space Strategic Plan.

The essence of our space strategy and the guiding vision of the Army space enterprise are to ensure access to resilient and relevant space-enabled capabilities to Army forces conducting unified land operations. To achieve this, our 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.

To achieve the three tenets, the Army developed the Space Operations Officer Qualification Course and the Army Space Cadre Basic Course to provide a foundation in properly training our space professionals. We also conduct space training via resident, mobile training teams, and distributed learning venues to support initial skills and qualification training, leader development, lifelong learning, and professional development in support of life cycle management. During the past year, USASMDC/ARSTRAT conducted approximately 160 space courses that provided about 5,500 soldiers and civilians essential space training. The Army continues to leverage the high-quality space training developed and administrated by the Air Force. In addition, each year, numerous space officers complete additional post-graduate studies at the Naval Postgraduate School, accredited civilian institutions, and training with industry. Finally, in conjunction with the Army Space Strategy Imple-

mentation Plan, we continue to incorporate space knowledge and leader development training into all Army schools. The Army remains committed to growing, training, developing, tutoring, advancing, and retaining space professionals. With the current fiscal constraints, we are concerned that essential space training will not maintain the necessary resources during the coming year and capabilities of tomorrow will suffer.

THE DAY-AFTER-TOMORROW—CONTINUED SPACE TECHNOLOGY MATERIEL DEVELOPMENT

Our final core task entails our materiel development function—pursuing essential capabilities for the day-after-tomorrow. Our goal is to expand technological capabilities to ensure space and space-based products provide warfighters, especially those that are remotely located, with dominant battlefield advantages. While we are very much aware that today's, and likely tomorrow's, fiscal realities will limit technology modernization efforts, we strongly believe that we must continue to conduct research, development, and demonstrations on capabilities that have great potential to return maximum advances in our combat effectiveness. We cannot afford to mortgage future combat readiness by continuing to defer research today. As such, we continue to prioritize, leverage, and invest in promising space research and development technologies.

Last year, I highlighted three responsive space Joint Capability Technology Demonstration (JCTD) Program efforts that have the potential to provide enhanced space capabilities to ground commanders and warfighters. Since last year, there has been much progress in these three space technology endeavors and I would like to provide you an update of these initiatives.

SMDC Nanosatellite Program-3 (SNaP–3):

Future constellations of relatively low cost nanosatellites, estimated to be approximately $300,000 each, deployed in mission-specific, low earth orbits can provide a cost effective, beyond-line-of-sight data communications capability. This capability is targeted for users who, without it, have no dedicated access to satellite communications. These satellites are also very useful in exfiltrating data from unattended ground sensors that have been placed in remote locations to track enemy troop movement, thereby reducing the friendly force footprint. SNaP–3, an OSD-approved JCTD, seeks to utilize three of these small satellites to provide dedicated coverage to a wide range of underserved users in remote areas. The Army is building and will launch three SNaP–3 nanosatellites to address this communications shortfall. We are hopeful that, in the near future, this initiative will transition to a program of record.

A Core Task—Provide Greater Capabilities to Future Warfighters

Kestrel Eye Visible Imagery Nanosatellite:

New technologies are enabling the production of low-cost nanosatellites which have ever increasing military utility. Kestrel Eye, an OSD-approved JCTD, is an endeavor to manufacture and fly three electro-optical near-nanosatellite-class imagery satellites that can be tasked directly by the tactical ground component warfighter. Weighing about 30 pounds and capable of producing 1.5 meter resolution imagery, data from each Kestrel Eye satellite will be down-linked directly to the same tasking warfighter via a data relay system, also accessible by other theater warfighters, without any continental United States relay pass-through or data filtering. At the production mode cost of approximately $1 million per spacecraft, the intent of this program is to demonstrate a small, tactical space-based imagery nanosatellite that could be propagated in large numbers to provide a cost effective, persistent capability to ground forces. Each satellite would have an operational life of greater than 2 years in low earth orbit. The initial Kestrel Eye launch is scheduled for next year.

Soldier-Warfighter Operationally Responsive Deployer for Space (SWORDS):

Concurrent with the shrinking size and reduced cost of militarily useful satellites is the need for an economical launch system. SWORDS, an OSD approved JCTD, is an initiative to develop a very low cost launch vehicle that can respond to a Combatant Commander's launch request within 24 hours. This launch system is designed to take advantage of low cost, proven technologies, and non-exotic materials to provide launch for small weight payloads to low earth orbit for about $1 million per launch vehicle. SWORDS employs a very simple design, using commercial off-the-shelf hardware from outside the aerospace industry. It incorporates a benign bi-propellant liquid propulsion system, and uses simple and low cost launch support and launch site hardware. SWORDS represents a game-changing approach to launch vehicle design and operations that holds great promise not only for the Army

tactical space enterprise, but for the civil and commercial space sectors launching small payloads into low earth orbit. In fact, we are partnering with NASA for development of the SWORDS initiative. The initial suborbital launch is scheduled for next year.

CONCLUSION

The Army is the largest user of space and space-based capabilities. As such, USASMDC/ARSTRAT is actively engaged in organizing, manning, equipping, and training space forces for the Army. We also, by working with organizations both internal and external to the Army, continue to develop and enhance technology to provide our warfighters the best battlefield capabilities. We will continue to rely on and advocate for space products and services provided by the DOD, other government agencies, our allies and coalition partners, and commercial entities in order to see, shoot, move, and communicate. Our use of and reliance on space is integral and absolutely critical to the Army's successful defense of this Nation. We will have challenges ahead as we determine the best courses of action to implement DOD and Army budget guidance. In adapting to the budget realities, space capabilities will become even more critical to enabling adaptive Army missions.

Space—The Ultimate High Ground

Invariably, discussions regarding space focus on the technology. The most critical space asset we possess are the dedicated soldiers, sailors, airmen, marines, and civilian space professionals who develop, field, and operate that technology and deliver its capabilities to the warfighter. Just as other Army and other Services personnel, the men and women of USASMDC/ARSTRAT will continue to focus on providing trained and ready space forces and capability enhancements to these warfighters, the Army, the joint community, and to the Nation.

I appreciate having the opportunity to speak on these important matters and look forward to addressing any questions you may have. Secure the High Ground and Army Strong!

Senator UDALL. Thank you, General.

We now turn to Ms. Cristina T. Chaplain, who is the Director, Acquisition and Sourcing Management, at the GAO.

STATEMENT OF MS. CRISTINA T. CHAPLAIN, DIRECTOR, ACQUISITION AND SOURCING MANAGEMENT, GOVERNMENT ACCOUNTABILITY OFFICE

Ms. CHAPLAIN. Thank you, Chairman Udall, Ranking Member Sessions, and Senator Fischer. I am pleased to be here today to talk about our work regarding space acquisitions.

The noteworthy thing is that our work continues to affirm that DOD is reducing acquisition risk on its satellite acquisitions. Cost growth is definitely less widespread. This is a very critical achievement in this time of constrained budgets to be reducing unnecessary cost growth, in my view.

We still have concerns about the systems and programs that support satellites. I wanted to highlight three of them today. They are also highlighted in my testimony in more detail.

First, we are still reporting gaps, adding up to years in some cases, between the time satellites are launched and the time ground systems and user equipment are delivered. That is really an issue because it could lead to waste of expensive space-based capability.

Second, we reported just last week that the networks that control and maintain satellites need to be streamlined and brought up to today's modern technology and practices. DOD concurred with these findings and recommendations.

Third, the rising cost of launching satellites is still an issue. We performed an analysis this year that showed about $46 billion is predicted to be spent over the next 5 years by the whole Federal

Government on launching satellites. Competition is key to reducing costs, but we will not know for several years whether there will actually be viable competitors. There is a long process they need to go through, and there are still unknowns about the outcome of that process. So it is something we will be watching.

Those are the three concerns I wanted to point out today. Again, they are highlighted more in my statement. I am happy to answer questions about them and anything else today.

[The prepared statement of Ms. Chaplain follows:]

PREPARED STATEMENT BY MS. CRISTINA T. CHAPLAIN

Chairman Udall, Ranking Member Sessions, and members of the subcommittee: I am pleased to be here today to discuss the Department of Defense's (DOD) space systems acquisitions.[1] Each year, DOD spends billions of dollars to acquire space-related capabilities that support military and other government operations—such as intelligence, reconnaissance and surveillance; communications; and homeland security—and to enable transformation of the way DOD collects and disseminates information. A single military satellite can cost more than $3 billion to acquire and more than $100 million to launch into orbit. Complementary systems, such as ground control software, can also cost billions. Given the expensive nature of space systems and today's fiscal environment, it is essential that DOD carefully manage these programs, apply best practices, and continually assess ways to reduce costs while maintaining a high degree of reliability and innovation.

This has not always been the case. Over the last decade, the majority of DOD's space acquisition programs were characterized by significant cost and schedule growth; new programs were canceled in the face of affordability concerns and other problems. In 2012, GAO reported that the worst of those space systems acquisition problems now appear to be behind the department.[2] Satellites long plagued by serious cost and schedule overruns are being launched. While new space systems acquisition programs are facing potential cost growth and schedule slips, they are not as widespread and significant as they were several years ago. Also, to its credit, DOD has taken an array of actions to reduce risks and strengthen leadership. However, the Department still faces serious challenges, such as the high cost of launching satellites, fragmented satellite control operations, as well as disconnects between fielding satellites and synchronizing ground systems.

My testimony today will focus on: (1) the current status and cost of DOD space systems acquisitions; (2) the results of GAO's space system-related reviews this past year; and (3) recent actions taken to address acquisition problems. This testimony is based on GAO reports issued over the past 5 years on space programs and weapon system acquisition best practices.[3] It is also based on work performed in support of our annual weapon system assessments, as well as space-related work in support of our reports on duplication, overlap, and fragmentation across the Federal Government.[4] Finally, this statement is based on updates on cost increases and investment trends and improvement actions taken since last year. To conduct these updates, we analyzed DOD funding estimates for selected major space systems acquisition programs from fiscal years 2012 through 2017 and interviewed officials from the Office of the Secretary of Defense. More information on our scope and methodology is available in our previously-issued reports. 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 conclu-

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[1] DOD space systems include space-based systems (satellites); ground based systems (command and control (C2), launch C2, processing stations, space surveillance stations); satellite launch vehicle systems (boosters, upper-stages, payload processing facilities, space launch facilities, ground support equipment), and user equipment (hand-held user terminals, data reception terminals, user terminals).

[2] GAO, DOD Faces Challenges in Fully Realizing Benefits of Satellite Acquisition Improvements, GAO–12–563T (Washington, DC: Mar. 21, 2012).

[3] See GAO related reports at the end of this statement.

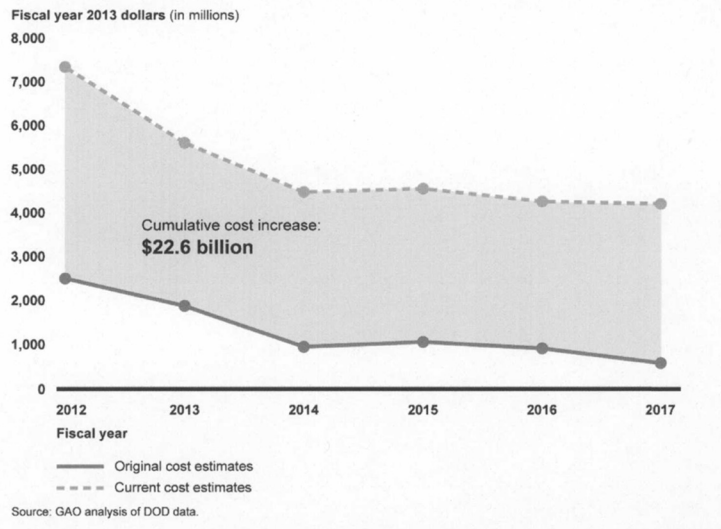
[4] GAO, Defense Acquisitions: Assessments of Selected Weapon Programs, GAO–13–294SP (Washington, DC: Mar. 28, 2013); 2013 Annual Report: Actions Needed to Reduce Fragmentation, Overlap, and Duplication and Achieve Other Financial Benefits, GAO–13–279SP (Washington, DC: Apr. 9, 2013); and 2012 Annual Report: Opportunities to Reduce Duplication, Overlap and Fragmentation, Achieve Savings, and Enhance Revenue, GAO–12–342SP (Washington, DC: Feb. 28, 2012).

sions 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.

BACKGROUND

DOD has a long history of troubled space systems acquisitions. Over the past decade, most of the large DOD space systems acquisition programs collectively experienced billions of dollars in cost increases and delayed schedules. In particular, a longstanding problem in DOD space systems acquisitions is that program costs have tended to go up significantly from initial cost estimates. As shown in figure 1, estimated costs for selected major space systems acquisition programs have increased by about $22.6 billion—nearly 230 percent—from fiscal years 2012 through 2017. Figure 1: Comparison between Original Cost Estimates and Current Cost Estimates for Selected Major Space Systems Acquisition Programs for fiscal years 2012 through 2017.

Figure 1: Comparison between Original Cost Estimates and Current Cost Estimates for Selected Major Space Systems Acquisition Programs for Fiscal Years 2012 through 2017



Source: GAO analysis of DOD data.

Note: Includes estimates for acquisition programs related to Advanced Extremely High Frequency, Evolved Expendable Launch Vehicle, Global Broadcast System, Global Positioning System II and III, Global Positioning System Operational Control System, Mobile User Objective System, Space Based Infrared System, and Wideband Global SATCOM. This chart does not include estimates for planned new space systems acquisition efforts such as Weather Satellite Follow-on, Joint Space Operations Center Mission System, Precision Tracking Space System, Space Based Space Surveillance Follow-on, and Space Fence for which total cost data were unavailable.

The gap between original and current estimates shows that DOD has fewer dollars available to invest in new programs or add to existing ones. DOD's overall level of investment over the 5-year period decreases until fiscal year 2014, at which point it levels off. The declining investment in the later years is the result of mature programs that have planned lower out-year funding, cancellation of a major space systems acquisition program and several development efforts, and the exclusion of several space systems acquisition efforts for which total cost data were unavailable. These efforts include the Joint Space Operations Center Mission System (JMS), Space Fence, Space Based Space Surveillance (SBSS) Follow-on, Precision Tracking Space System (PTSS), and Weather Satellite Follow-on.

We have previously reported that programs have experienced cost increases and schedule delays that have resulted in potential capability gaps in missile warning,

military communications, and weather monitoring.[5] For instance, unit costs for one of the most troubled programs, the Space Based Infrared System (SBIRS) have climbed about 230 percent to over $3 billion per satellite, with the launch of the first satellite about 9 years later than predicted. Similarly, 8 years after a development contract for the National Polar-orbiting Operational Environmental Satellite System (NPOESS) program was awarded in 2002, the cost estimate had more than doubled—to about $15 billion, launch dates had been delayed by over 5 years, significant functionality had been removed from the program, and the program's triagency management structure had proven to be ineffective. In February 2010, it was announced that the National Oceanic and Atmospheric Agency (NOAA) and DOD would no longer jointly procure the NPOESS satellite system and, instead, each agency would undertake separate acquisitions. Consequently, the risks of gaps in weather satellite monitoring data have increased. Other programs, such as the Transformational Satellite Communications System, were canceled several years earlier because they were found to be too ambitious and not affordable at a time when the DOD was struggling to address critical acquisition problems elsewhere in the space systems portfolio.

Our past work has identified a number of causes of acquisition problems, but several consistently stand out. At a higher level, DOD tended to start more weapon programs than was affordable, creating a competition for funding that focused on advocacy at the expense of realism and sound management. DOD also tended to start its space systems programs before it had the assurance that the capabilities it was pursuing could be achieved within available resources and time constraints. For example, when critical technologies planned for a satellite system are still in relatively early stages of discovery and invention, there is no way to accurately estimate how long it would take to design, develop, and build the system. Finally, programs typically 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's preference to make larger, complex satellites that perform a multitude of missions stretched technology challenges beyond current capabilities in some cases. In the past, funding instability, poor contractor oversight, and relaxed quality standards have also contributed to acquisition problems.

We have also reported that fragmented leadership and lack of a single authority in overseeing the acquisition of space programs have created challenges for optimally acquiring, developing, and deploying new space systems.[6] Past studies and reviews have found that responsibilities for acquiring space systems are diffused across various DOD organizations, even though many of the larger programs, such as the Global Positioning System (GPS) and those to acquire imagery and environmental satellites, are integral to the execution of multiple agencies' missions. We reported that with multiagency space programs, success is often only possible with cooperation and coordination; however, successful and productive coordination appears to be the exception and not the rule. This fragmentation is problematic not only because of a lack of coordination that has led to delays in fielding systems, but also because no one person or organization is held accountable for balancing governmentwide needs against wants, resolving conflicts and ensuring coordination among the many organizations involved with space systems acquisitions, and ensuring that resources are directed where they are most needed.

Over the past 5 years, our work 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.

DOD has generally concurred with our recommendations, and has undertaken a number of actions to establish a better foundation for acquisition success. For newer satellite acquisition efforts, DOD has attempted to incorporate lessons learned from its experiences with earlier efforts. For example, the GPS III program, which began product development in 2008, is using a "back to basics" approach, emphasizing rigorous systems engineering, use of military specifications and standards, and an in-

[5] GAO, Space Acquisitions: DOD Poised to Enhance Space Capabilities but, Persistent Challenges Remain in Developing Space Systems, GAO–10–447T (Washington, DC: Mar. 10, 2010).

[6] GAO, 2012 Annual Report: Opportunities to Reduce Duplication, Overlap and Fragmentation, Achieve Savings, and Enhance Revenue, GAO–12–342SP (Washington, DC: Feb. 28, 2012); and Space Acquisitions: DOD Poised to Enhance Space Capabilities but, Persistent Challenges Remain in Developing Space Systems, GAO–10–447T (Washington, DC: Mar. 10, 2010).

cremental approach to providing capability. Thus far, the work performed on the development of the first two satellites is costing more than expected—but not on the scale of earlier programs—and its schedule remains on track efforts. For example, the GPS III program, which began product development in 2008, is using a "back to basics" approach, emphasizing rigorous systems engineering, use of military specifications and standards, and an incremental approach to providing capability. Thus far, the work performed on the development of the first two satellites is costing more than expected—but not on the scale of earlier programs—and its schedule remains on track efforts. For example, the GPS III program, which began product development in 2008, is using a "back to basics" approach, emphasizing rigorous systems engineering, use of military specifications and standards, and an incremental approach to providing capability. Thus far, the work performed on the development of the first two satellites is costing more than expected—but not on the scale of earlier programs—and its schedule remains on track.[7]

Our prior testimonies have cited an array of actions as well.[8] For instance, the Office of the Secretary of Defense created a new office under the Undersecretary of Defense for Acquisition, Technology and Logistics to oversee all major DOD space and intelligence related acquisitions and it began applying its broader weapon system acquisition policy (DOD Instruction 5000.02, Operation of the Defense Acquisition System (Dec. 8, 2008)) to space systems, instead of allowing a tailored policy for space that enabled DOD to commit to major investments before knowing what resources will be required to deliver promised capability.[9] Among other initiatives, the Air Force undertook efforts to improve cost estimating and revitalize its acquisition workforce and program management assistance programs. Further, in 2009, for major weapons programs, Congress enacted the Weapon Systems Acquisition Reform Act of 2009, which required greater emphasis on front-end planning and, for example, refining concepts through early systems engineering, strengthening cost estimating, building prototypes, holding early milestone reviews, and developing preliminary designs before starting system development.

THE CURRENT STATUS AND COST OF SPACE SYSTEMS ACQUISITIONS

Most of DOD's major satellite programs are in mature phases of acquisition and cost and schedule growth is not as widespread as it was in prior years. However, the satellites, ground systems, and user terminals are not optimally aligned and the cost of launching satellites continues to be expensive.

Most of DOD's major satellite programs are in mature phases of acquisition, that is, the initial satellites have been designed, fabricated and launched into orbit while additional satellites of the same design are being produced. Only two major satellite programs are in earlier phases of acquisition—the GPS III program and the PTSS program. For the portfolio of major satellite programs, new cost and schedule growth is not as widespread as it was in prior years, but DOD is still experiencing problems in these programs. For example, though the first two SBIRS satellites have launched, program officials are predicting a 14 month delay on the production of the third and fourth geosynchronous earth orbit (GEO) satellites due in part to technical challenges, parts obsolescence, and test failures. As we reported in March 2013, program officials are predicting about a $440 million cost overrun for these satellites.[10] Also, the work performed to date for development of the first two GPS III satellites continues to cost more than DOD expected. Since the program entered system development, total program costs have increased approximately $180 million. The GPS III program office has attributed this to a variety of factors, such as inefficiencies in the development of the satellite bus and the navigation payload.[11]

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[7] Air Force officials recently stated that, although GPS III is still maintaining an April 2014 "available for launch" date for the first satellite, the Air Force delayed the launch of the first GPS III space vehicle by a year in order to synchronize it with the availability of the GPS Operational Control Segment (OCX) Block 0, without which the satellites cannot be launched and checked out.

[8] GAO, Space Acquisitions: DOD Faces Challenges in Fully Realizing Benefits of Satellite Acquisition Improvements, GAO–12–563T (Washington, DC: Mar. 21, 2012); and Space Acquisitions: DOD Delivering New Generations of Satellites, but Space System Acquisition Challenges Remain, GAO–11–590T (Washington, DC: May 11, 2011).

[9] DOD Instruction 5000.02, Operation of the Defense Acquisition System (2008).

[10] GAO, Defense Acquisitions: Assessments of Selected Weapon Programs, GAO–13–294SP (Washington, DC: March 28, 2013).

[11] Every satellite has a bus and payload. The bus is the body of the satellite. It carries the payload and is composed of a number of subsystems, like the power supply, antennas, telemetry and tracking command, and mechanical and thermal control subsystems. The bus also provides electrical power, stability, and propulsion for the entire satellite. The payload—carried by the

Program officials stated that the cost growth was partially due to the program's use of a back to basics approach, which they stated shifted costs to earlier in the acquisition as a result of more stringent parts and materials requirements. They anticipate these requirements will result in fewer problems later in the acquisition.

Table 1 describes the status of the satellite programs we have been tracking in more detail.

Table 1: Status and Cost of Selected Satellite Programs

Program (mission)	Program details
Advanced Extremely High Frequency (AEHF) (satellite communications)	Original total program cost: $6.3 billion Current total program cost: $14.1 billion Original quantity: 5 Current quantity: 6 Schedule: First launch occurred in August 2010, 6 years later than initially planned, and the second launch occurred May 2012. The third launch is scheduled for fall of 2013, and the fourth satellite, currently in production, is scheduled to be launched in 2017. AEHF satellites will replenish the existing Milstar system with higher-capacity, survivable, jam-resistant, worldwide, secure communication capabilities for strategic and tactical warfighters.
Global Positioning System (GPS) III (positioning, navigation, and timing)	Original total program cost: $4.1 billion Current total program cost: $4.2 billion Quantity: 8 Schedule: First launch is anticipated in 2015. GPS is a constellation of multiple generations of GPS satellites that provide global positioning, navigation, and timing capability to both military and civil users worldwide.
Mobile User Objective System (MUOS) (satellite communications)	Original total program cost: $6.9 billion Current total program cost: $7.3 billion Quantity: 6 Schedule: The first satellite was launched in February 2012—26 months later than planned at development start. The second satellite is scheduled to be launched in July 2013. MUOS is expected to provide a worldwide, multiservice population of mobile and fixed-site terminal users with increased narrowband communications capacity and improved availability for small terminal users.
Space Based Infrared System (SBIRS) (infrared intelligence, surveillance, and reconnaissance)	Original total program cost: $4.7 billion Current total program cost: $18.8 billion Original quantity: 5 Current quantity: 6 Schedule: The first SBIRS satellite launched in May 2011— roughly 9 years later than estimated at program start. The second satellite launched in March 2013. SBIRS is being developed to replace the Defense Support Program and perform a range of missile warning, missile defense, technical intelligence, and battle space awareness missions. SBIRS will consist of four GEO satellites, two sensors on host satellites in highly elliptical orbit, two replenishment satellites and sensors, and fixed and mobile ground stations.

bus—includes all the devices a satellite needs to perform its mission, which differs for every type of satellite.

Precision Tracking Space System (PTSS) (ballistic missile defense)	Total program cost: Cost baseline not established. Quantity: 9 Schedule: The program planned to first launch two laboratory-built developmental satellites in March 2018 and then launch industry-built satellites, achieving the full satellite constellation no sooner than 2023. The Missile Defense Agency (MDA) is developing PTSS as an operational component of its Ballistic Missile Defense System to track ballistic missiles after boost and through the middle part of their flight. PTSS was recently proposed for termination in the President's 2014 budget submission based on schedule risk and cost associated with the concurrent acquisition strategy.
Weather Satellite Follow-on (WSF) (climate and weather monitoring)	Total program cost: Cost baseline not established. Quantity: Not established. Schedule: Schedule baseline not established. WSF is to replace the Defense Meteorological Satellite Program, which the Air Force uses to obtain environmental data that are processed to provide graphical weather images and specialized weather products.
Wideband Global SATCOM (WGS) (satellite communications)	Original program cost: $980 million Current total program cost: $3.9 billion Original quantity: 3 Current quantity: 10 Schedule: The first satellite was launched in October 2007, over 3 years later than estimated at program start. Currently, four satellites are in orbit and the fifth satellite is estimated to launch in May 2013. WGS is intended to provide essential communications services to U.S. warfighters, allies, and coalition partners during all levels of conflict short of nuclear war.

Source: GAO analysis of DOD data and previous GAO reports.

Though satellite programs are not experiencing cost and schedule problems as widespread as in years past, we have reported that ground control systems and user terminals in most of DOD's major space systems acquisitions are not optimally aligned, leading to underutilized on-orbit satellite resources and limited capability provided to the warfighter.[12] For example:

- Over 90 percent of the MUOS's planned capability is dependent on the development of compatible user terminals. Although the first MUOS satellite was launched over a year ago, operational testing of MUOS with production-representative user terminals is not expected to occur until the second quarter of fiscal year 2014.
- The SBIRS program revised its delivery schedule of ground capabilities to add increments that will provide the warfighter some capabilities sooner than 2018, but complete and usable data from a critical sensor will not be available until about 7 years after the satellite is on orbit.
- The Family of Advanced Beyond Line-of-Sight Terminals (FAB–T) program, which is developing user terminals intended to communicate with AEHF satellites, has experienced numerous cost and schedule delays and is currently not synchronized with the AEHF program, which launched its second satellite last year while the FAB–T program has yet to deliver any capabilities. Current estimates show that FAB–T will reach initial operational capability for some requirements in 2019, about 5 years after AEHF is scheduled to reach its initial operational capability.
- GPS OCX is required for the launch of the first GPS III satellite because the existing ground control software is not compatible with the new GPS satellites. Realizing that the new ground control system would not be delivered in time to launch the first GPS III satellite, the Air Force added funding to the contract to accelerate development of the software that can launch and checkout the GPS III satellite, leaving the other capabilities—like the ability to command and control the satellite—to be delivered in late 2016. Subsequently, the launch of the first GPS III satellite has been delayed to May 2015 to better synchronize with the availability of the launch software.

Though there are inherent difficulties in aligning delivery of satellites, ground control systems, and user terminals, we reported in 2009 that the lack of synchronization between segments of space acquisition programs is largely the result of the same core issues that hamper acquisitions in general—requirements instability,

[12] GAO, Defense Acquisitions: Challenges in Aligning Space System Components, GAO–10–55 (Washington, DC: Oct. 29, 2009); Space Acquisitions: DOD Poised to Enhance Space Capabilities but, Persistent Challenges Remain in Developing Space Systems, GAO–10–447T (Washington, DC: Mar. 10, 2010); and GAO, Defense Acquisitions: Assessments of Selected Weapon Programs, GAO–13–294SP (Washington, DC: Mar. 28, 2013).

funding instability, insufficient technology maturity, underestimation of complexity, and poor contractor oversight, among other issues.[13] In addition, user terminals are not optimally aligned because of a lack of coordination and effective oversight over the many military organizations that either develop user terminals or have some hand in development. We recommended that the Secretary of Defense take a variety of actions to help ensure that DOD space systems provide more capability to the warfighter through better alignment and increased commonality, and to provide increased insight into ground asset costs. DOD generally agreed with these recommendations.

Another acquisition challenge facing DOD is the cost of launching satellites into space. DOD has benefited from a long string of successful launches, including three military and four intelligence community satellites this year. However, each launch can range from $100 million to over $200 million. Additional money is spent to support launch infrastructure. An analysis we performed this year showed that from fiscal years 2013 through 2017, the government can expect to spend approximately $46 billion on launch activities.[14] Meanwhile, we reported in prior years that too little was known about the factors that were behind cost and price increases.[15] The Air Force has developed a new launch acquisition strategy which includes a block buy approach for future launches. At the same time, it is implementing an effort to introduce new launch providers. Both efforts are designed to help lower costs for launch, but they face challenges, which are discussed further in the next section.

RECENT GAO FINDINGS RELATED TO SPACE SYSTEMS ACQUISITIONS

Over the past year, we have reported on DOD's progress in closing knowledge gaps in its new Evolved Expendable Launch Vehicle (EELV) acquisition strategy, DOD's efforts to introduce new launch providers, opportunities to help reduce satellite program costs, and the Air Force's satellite control operations and modernization efforts with comparisons to commercial practices. These reports further highlight the successes and challenges that have faced the space community as it has sought to mitigate rising costs and deliver modernized capabilities.

EELV Acquisition Strategy

We reported in September 2011 that DOD needed to ensure the new acquisition strategy was based on sufficient information, as there were significant uncertainties relating to the health of the launch industrial base, contractor cost or pricing data, mission assurance costs and activities, numbers of launch vehicles needed, and future engine prices which were expected to double or triple in the near term.[16] As a result, DOD was at risk of committing to an acquisition strategy-including an expensive, multi-billion dollar block buy of launch vehicle booster cores-before it had information essential to ensuring business decisions contained in the strategy were sound.[17] Among other things, we recommended DOD assess engine costs and mission assurance activities, reassess the length of the proposed block buy, and consider how to address broader launch acquisition and technology development issues. DOD generally concurred with the recommendations. The Air Force issued its new EELV acquisition strategy in November 2011. Following our review, the National Defense Authorization Act for Fiscal Year 2012 required that DOD report to congressional committees a description of how it implemented the recommendations contained in our report and for GAO to assess that information.[18]

We reported in July 2012, that DOD had numerous efforts in progress to address the knowledge gaps and data deficiencies identified in our September 2011 report, such as completing or obtaining independent cost estimates for two EELV engines

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[13] GAO, Defense Acquisitions: Challenges in Aligning Space System Components, GAO–10–55 (Washington, DC: Oct. 29, 2009).

[14] The $46 billion is based on the President's budget submission for fiscal year 2013. In June 2012, DOD estimated the total cost of the EELV program to be nearly $70 billion through 2030. This represents the costs incurred since the inception of the program in 1995. The Air Force is currently developing a new cost estimate that considers potentially lower contract prices resulting from future competition in the program.

[15] GAO, Evolved Expendable Launch Vehicle: DOD Is Addressing Knowledge Gaps in Its New Acquisition Strategy, GAO–12–822 (Washington, DC: July 26, 2012); and Evolved Expendable Launch Vehicle: DOD Needs to Ensure New Acquisition Strategy Is Based on Sufficient Information, GAO–11–641 (Washington, DC: Sept. 15, 2011).

[16] GAO, Evolved Expendable Launch Vehicle: DOD Needs to Ensure New Acquisition Strategy Is Based on Sufficient Information, GAO–11–641 (Washington, DC: Sept. 15, 2011).

[17] The booster core is the main body of a launch vehicle. In the EELV program, common booster cores are used to build all of the Atlas V and Delta IV launch vehicles. Medium and intermediate launch vehicles use one core each, while the Delta IV Heavy launch vehicle requires three.

[18] Pub. L No 112–81, § 839 (2011).

and completing a study of the liquid rocket engine industrial base.[19] We reported that officials from DOD, NASA, and NRO had initiated several assessments to obtain needed information, and had worked closely to finalize new launch provider certification criteria for national security space launches. However, we found that more action was needed to ensure that launch mission assurance activities were not excessive, to identify opportunities to leverage the government's buying power through increased efficiencies in launch acquisitions, and to strategically address longer-term technology investments. We reported that some information DOD was gathering could set the stage for longer-term strategic planning for the program, especially in critical launch technology research and development decisions and that investing in a longer-term perspective for launch acquisitions was important to fully leverage the government's buying power and maintain a healthy industrial base.

Launch Services New Entrant Certification Guide

In 2011, the Air Force, National Aeronautics and Space Administration (NASA), and National Reconnaissance Office (NRO) began implementing a coordinated strategy—called the Air Force Launch Services New Entrant Certification Guide (Guide)—to certify new entrants to provide launch capability on EELV-class launch vehicles. New entrants are launch companies that are working toward certifying their launch vehicle capabilities so that they may be allowed to compete with the current sole-source contractor for government launches. Launch vehicle certification is necessary to ensure that only proven, reliable launch vehicles will be used to launch government satellites. The House Armed Services Committee Report accompanying the National Defense Authorization Act for Fiscal Year 2013 directed GAO to review and analyze the implementation of the Guide.[20]

In February 2013, we reported that the Air Force based its Guide on existing NASA policy and procedures with respect to payload risk classification and launch vehicle certification.[21] We found that the Air Force, NASA, and NRO were working to coordinate and share information to facilitate launch vehicle certification efforts, but that each agency would determine for itself when certification had been achieved. As a result, some duplication and overlap of efforts could occur. We also found that the Air Force had added other prerequisites to certification for new entrants that were not captured within the Guide.

We reported that while potential new entrants stated that they were generally satisfied with the Air Force's efforts to implement the Guide, they identified several challenges to certification, as well as perceived advantages afforded to the incumbent launch provider. For example, new entrants stated that they faced difficulty in securing enough launch opportunities to become certified. In November 2012, the Under Secretary of Defense for Acquisition, Technology and Logistics directed the Air Force to make available up to 14 launches for competition to new entrants, provided they demonstrate the required number of successful launches and provide the associated data in time to compete. If new entrants had not completed their final certification launch in time to compete, the newly-available launches would likely be awarded to the incumbent provider. New entrants stated they must also respond to changes in Air Force requirements that could impact their launch vehicle design and certification schedules, and considered some Air Force requirements to be overly restrictive; for example, they must be able to launch a minimum of 20,000 pounds to low earth orbit from specific Air Force launch facilities (versus facilities the new entrants currently use). The Air Force stated that 20,000 pounds represented the low end of current EELV lift requirements, and that alternate launch sites were not equipped for the Air Force's national security launches. Further, new entrants noted that the incumbent provider received ongoing infrastructure and development funding from the government, an advantage not afforded to the new entrants, and that historical criteria for competition in the EELV program were more lenient. The Air Force acknowledged that criteria for competition are different, reflective of differences in the acquisition environment.

Opportunities to Help Reduce Government Satellite Program Costs

In our April 2013 report on reducing duplication, overlap, and fragmentation within the Federal Government, we found that government agencies, including DOD, could achieve considerable cost savings on some missions by leveraging com-

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[19] GAO, Evolved Expendable Launch Vehicle, DOD Is Addressing Knowledge Gaps in Its New Acquisition Strategy, GAO–12–822 (Washington, DC: July 26, 2012).

[20] H.R. Rep. No. 112–479, at 186 (2012); Pub. L. No 112–239 (2013).

[21] GAO, Launch Services New Entrant Certification Guide, GAO–13–317R (Washington, DC: Feb. 7, 2013).

mercial spacecraft through innovative mechanisms.[22] These mechanisms include hosted payload arrangements where government instruments are placed on commercial satellites, and ride sharing arrangements where multiple satellites share the same launch vehicle.

We reported that DOD is among the agencies that are actively using or beginning to look at these approaches in order to save costs. For instance, DOD has two ongoing hosted payload pilot missions and has taken preliminary steps to develop a follow-on effort.[23] DOD estimated that the Commercially Hosted Infrared Payload Flight Demonstration Program answered the majority of the government's technical questions through its commercial partnership, while saving it over $200 million over a dedicated technical demonstration mission. In addition, DOD is investigating ride sharing to launch GPS satellites beginning in fiscal year 2017, which could save well over $60 million per launch.

While hosted payloads and ride sharing hold promise for providing lower-cost access to space in the future, we found that there are a variety of challenges. For instance, government agencies that have traditionally managed their own space missions face cultural challenges in using hosted payload arrangements and in November 2010, we found that the DOD space community is highly risk averse to adopting technologies from commercial providers that are new to DOD.[24] In addition, agency officials expressed concerns about using a commercial host for their payloads, noting that they would lose some control over their missions. DOD officials noted that their security and mission assurance requirements and processes may make integrating hosted payloads on commercial satellites more complicated to manage. Further, agency officials expressed concerns about scheduling launches and noted that commercial providers may not be flexible about changing launch dates if the instruments or satellites experience delays.

We reported that using hosted payloads and ride sharing are likely to reduce government launch costs and savings estimates reported to date are in the hundreds of millions of dollars over the life of the projects. However, we were unable to quantify the potential for further financial benefits because there is too limited a pool of available data. Once the government has collected more data and gained more experience in collaborating with commercial satellite vendors on ride sharing and hosted payloads, actual data on cost savings and cost avoidances should be more readily available.

Satellite Control Operations

DOD manages the Nation's defense satellites, which are worth at least $13.7 billion, via ground stations located around the world. These ground stations and supporting infrastructure perform, in part, the function of maintaining the health of the satellite and ensuring it stays in its proper orbit (activities collectively known as satellite control operations). Some of DOD's ground stations are linked together to form networks. The Air Force Satellite Control Network (AFSCN) is the largest of these networks. Based on the direction in a House Armed Services Committee Report for our review and discussions with defense committee staff, we reviewed the Air Force's satellite control operations and modernization efforts.[25]

We reported this month that DOD's satellite control networks are fragmented and potentially duplicative.[26] Over the past decade, DOD has increasingly deployed standalone satellite control operations networks, which are designed to operate a single satellite system, as opposed to shared systems that can operate multiple kinds of satellites. Dedicated networks can offer many benefits to programs, including possible lower risks and customization for a particular program's needs. How-

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[22] GAO, 2013 Annual Report: Actions Needed to Reduce Fragmentation, Overlap, and Duplication, and Achieve Other Financial Benefits, GAO–13–279SP (Washington, DC: Apr. 9, 2013).

[23] The missions are the Internet Protocol Routing in Space Joint Capability Technology Demonstration, which is to provide Internet routing onboard the satellite in order to provide users with increased speed and direct access to the Internet, eliminating the need for a ground-based teleport; and the Commercially Hosted Infrared Payload Flight Demonstration Program, which is an experiment designed to support next-generation infrared sensor development by placing a wide field of view infrared sensor on a commercial communications satellite.

[24] See GAO, Space Acquisitions: Challenges in Commercializing Technologies Developed under the Small Business Innovation Research Program, GAO–11–21 (Washington, DC: Nov. 10, 2010).

[25] House of Representatives Armed Services Committee Report No. 112–78, at 117 (2011), accompanying H.R. 1540, the bill for the National Defense Authorization Act for Fiscal Year 2012 (Pub. L. No. 112–81 (2011)), directed GAO to assess DOD satellite operations modernization efforts and identify potential best practices and efficiencies. To fulfill this mandate, we delivered an oral briefing to the House and Senate Armed Services committees on February 6, 2012.

[26] GAO, Satellite Control: Long-Term Planning and Adoption of Commercial Practices Could Improve DOD's Operations, GAO–13–315 (Washington, DC: April 18, 2013).

ever, they can also be more costly and have led to a fragmented, and potentially duplicative, approach which requires more infrastructure and personnel than shared operations. We reported that, according to Air Force officials, DOD has not worked to move its current dedicated operations towards a shared satellite control network, which could better leverage DOD investments. We also reported that the AFSCN was undergoing modernization efforts, but these would not increase the network's capabilities. The efforts—budgeted at about $400 million over the next 5 years—primarily focus on sustaining the network at its current level of capability and do not apply a decade of research recommending more significant improvements to the AFSCN that would increase its capabilities.

Additionally, we found that commercial practices like network interoperability, automation, and use of commercial off-the-shelf products have the potential to increase the efficiency and decrease costs of DOD satellite control operations. Both DOD and commercial officials we spoke to agreed that there were opportunities for DOD to increase efficiencies and lower costs through these practices. Numerous studies by DOD and other government groups have recommended implementing or considering these practices, but DOD has generally not incorporated them into DOD satellite control operations networks.

Finally, we found that DOD faced barriers that complicate its ability to make improvements to its satellite control networks and adopt commercial practices. For example, DOD did not have a long-term plan for satellite control operations; DOD lacked reliable data on the costs of its current control networks and was unable to isolate satellite control costs from other expenses; there was no requirement for satellite programs to establish a business case for their chosen satellite control operations approach; and even if program managers wanted to make satellite control operations improvements, they did not have the autonomy to implement changes at the program level. We concluded that until DOD begins addressing these barriers, the department's ability to achieve significant improvements in satellite control operations capabilities would be hindered. We recommended that the Secretary of Defense direct future DOD satellite acquisition programs to determine a business case for proceeding with either a dedicated or shared network for that program's satellite control operations and develop a department-wide long-term plan for modernizing its AFSCN and any future shared networks and implementing commercial practices to improve DOD satellite control networks. DOD agreed with our recommendations.

RECENT ACTIONS TAKEN TO ADDRESS SPACE ACQUISITION PROBLEMS

Congress and DOD continue to take steps towards reforming the defense acquisition system to increase the likelihood that acquisition programs will succeed in meeting planned cost and schedule objectives. For example, in December 2012, we reported that the DOD had taken steps to implement fundamental Weapon Systems Acquisition Reform Act of 2009 (the Reform Act) provisions, including those for approving acquisition strategies and better monitoring weapon acquisition programs.[27, 28] The offices established by the Reform Act are in the process of developing, issuing, and implementing policies in response to the Reform Act's provisions. We reported that DOD has taken steps to:

- develop policy and guidance to the military services for conducting work in their respective areas,
- approve acquisition documents prior to milestone reviews,
- monitor and assess weapon acquisition program activities on a consistent basis, and
- develop performance measures to assess acquisition program activities.

Fundamentally, these Reform Act provisions should help (1) programs replace cost and schedule risk with knowledge and (2) set up more executable programs. Addi-

[27] GAO, Weapons Acquisition Reform: Reform Act Is Helping DOD Acquisition Programs Reduce Risk, but Implementation Challenges Remain, GAO–13–103, (Washington DC: Dec. 14, 2012).

[28] Pub. L. No. 111–23, as amended by the Ike Skelton National Defense Authorization Act for Fiscal Year 2011, Pub. L. No. 111–383 §§ 813 and 1075, and the National Defense Authorization Act for Fiscal Year 2012, Pub. L. No. 112–81 §§ 819 and 837; as implemented by DOD Directive-Type Memorandum (DTM) 09–027, "Implementation of Weapon Systems Acquisition Reform Act of 2009" (Dec. 4, 2009, incorporating Change 4, Jan. 11, 2013). The Act, among other things: established high-level acquisition oversight offices and positions (including Cost Assessment and Program Evaluation, Program Assessment and Root Cause Analyses, Director of Developmental Test and Evaluation, and Director of Systems Engineering); required competitive prototyping as part of the technology development phase; required preliminary design review before the start of development; required competition throughout the acquisition lifecycle; and encouraged trade-offs among cost, schedule, and performance objectives at Milestone B to ensure affordability.

tionally, as part of its Better Buying Power initiative, DOD in November 2012 issued descriptions of 36 initiatives aimed at increasing productivity and efficiency in DOD acquisitions.[29] DOD plans to solicit industry and stakeholder comments on these initiatives and plans to ultimately provide detailed requirements on implementing these initiatives to the acquisition workforce.

Further, in January 2013, Congress passed the National Defense Authorization Act of 2013, which required that DOD's Under Secretary of Defense for Acquisition, Technology and Logistics submit a report on schedule integration and funding for each major satellite acquisition program.[30] The report must include information on the segments of the programs; the amount of funding approved for the program and for each segment that is necessary for full operational capability of the program; and the dates by which the program and each segment are anticipated to reach initial and full operational capability, among other items. If the program is considered to be non-integrated, DOD must submit the required report to Congress annually. Tracking the schedules of major satellite programs and the ground systems and user equipment necessary to utilize the satellites may help DOD synchronize its systems.

Additionally, officials from the Space and Intelligence Office, within the Office of Secretary of Defense, told us that DOD has undertaken additional actions to improve space systems acquisitions since we last reported on its efforts in March 2012.[31] These actions include chartering Defense Space Council architecture reviews in key space mission areas that are ongoing or completed, such as resilient protected, narrowband, and wideband satellite communications; environmental monitoring; overhead persistent infrared; and space control, according to these officials.[32] The architecture reviews are to inform DOD's programming, budgeting, and prioritization for the space mission area. According to the officials, the Defense Space Council has brought a high-level focus on space issues through active senior-level participation in monthly meetings. DOD also participates in the newly reformed Space Industrial Base Council, which is made up of senior level personnel at agencies across the Federal Government that develop space systems. The purpose of the council is to understand how DOD's and other agencies' acquisition strategies impact the space industrial base. Additionally, according to the officials, the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics completed a major study on space acquisition reform to assess the root causes of poor performance in the space acquisition enterprise, focusing on the largest areas of cost growth. Furthermore, the officials stated that they are continuing efforts to buy blocks of AEHF and SBIRS satellites to realize savings that will be reinvested in high-priority research and development for space programs to mitigate the challenges associated with planned use of critical technologies when a satellite system is in the early stages of development. The officials stated that these block buys will also encourage stable production and help to achieve affordability targets DOD has set for the majority of the large, critical space programs. While these actions are encouraging, we have not evaluated their effectiveness.

The changes DOD has been making to leadership and oversight appear to be increasing senior management attention on space programs, but it is unclear whether the changes will be enough to overcome the problems we identified with fragmented leadership in the past. We have consistently found that the lack of a single authority for cross cutting missions, such as GPS or space situational awareness, has contributed to disconnects in the delivery of related systems as well as delays in the development of architectures and other tools important to balancing wants versus needs. Fragmented leadership has also been a contributing factor to other challenges we have noted in this statement—increasing launch service costs, synchronizing ground and satellite systems, and improving satellite operations. This condition persists. As part of our April 2013 annual report on reducing duplication, overlap, and fragmentation within the Federal Government, we reported that the administration has taken an initial step to improve interagency coordination, but has

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[29] DOD Memorandum, Better Buying Power 2.0: Continuing the Pursuit for Greater Efficiency and Productivity in Defense Spending, Washington, DC: Nov. 13, 2012.

[30] Pub. L. No. 112–239, § 911 (2013).

[31] GAO, Space Acquisitions: DOD Faces Challenges in Fully Realizing Benefits of Satellite Acquisition Improvements, GAO–12–563T (Washington, DC: Mar. 21, 2012).

[32] In November 2010, the Deputy Secretary of Defense directed the creation of a Defense Space Council—chaired by the DOD Executive Agent for Space (currently the Under Secretary of the Air Force) and with representatives from across DOD—to inform, coordinate, and resolve space issues for DOD.

not fully addressed the issues of fragmented leadership and a lack of a single authority in overseeing the acquisition of space programs.[33]

Lastly, the Air Force and other offices within DOD are also considering different acquisition models for the future, including the use of hosted payloads as well as developing larger constellations of smaller, less-complex satellites that would require small, less-costly launch vehicles and offer more resilience in the face of growing threats to space assets. However, such a transition could also have risk and require significant changes in acquisition processes, requirements setting, organizational structures, and culture. The long-standing condition of fragmented leadership and the risk-averse culture of space could stand in the way of making such a change.

In conclusion, DOD has made credible progress in stabilizing space programs. However, there are challenges still to be dealt with, such as disconnects between the delivery of satellites and their corresponding ground control systems and user equipment and the rising cost of launch. The ultimate challenge, however, will be preparing for the future, as budget constraints will require DOD to make tough tradeoff decisions in an environment where leadership is fragmented. We look forward to continuing to work with Congress and DOD in assessing both today and tomorrow's challenges in space acquisition and identifying actions that can be taken to help meet these challenges.

Chairman Udall, Ranking Member Sessions, this completes my prepared statement. I would be happy to respond to any questions you and members of the subcommittee may have at this time.

CONTACTS AND ACKNOWLEDGMENTS

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RELATED GAO PRODUCTS

Satellite Control: Long-Term Planning and Adoption of Commercial Practices Could Improve DOD's Operations. GAO–13–315. (Washington, DC: April 18, 2013).

2013 Annual Report: Actions Needed to Reduce Fragmentation, Overlap, and Duplication and Achieve Other Financial Benefits. GAO–13–279SP. (Washington, DC: April 9, 2013).

Defense Acquisitions: Assessments of Selected Weapon Programs. GAO–13–294SP. (Washington, DC: March 28, 2013).

High-Risk Series: An Update. GAO–13–283. (Washington, DC: February 2013).

Launch Services New Entrant Certification Guide. GAO–13–317R. (Washington, DC: February 7, 2013).

Evolved Expendable Launch Vehicle: DOD Is Addressing Knowledge Gaps in Its New Acquisition Strategy. GAO–12–822. (Washington, DC: July 26, 2012).

Environmental Satellites: Focused Attention Needed to Mitigate Program Risks. GAO–12–841T. (Washington, DC: June 27, 2012).

Polar-Orbiting Environmental Satellites: Changing Requirements, Technical Issues, and Looming Data Gaps Require Focused Attention. GAO–12–604. (Washington, DC: June 15, 2012).

Missile Defense: Opportunities Exist to Strengthen Acquisitions by Reducing Concurrency and Improving Parts Quality. GAO–12–600T. (Washington, DC: April 25, 2012).

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Senator UDALL. Thank you for that summary.

Let us go right to questions. We will do 5-minute rounds and I will recognize myself for the first 5 minutes.

General Shelton, let us start with sequestration. You have had to cut back on a number of missions, including some missile warning and space surveillance operations. Can you describe which of your systems are affected by sequestration, and do you anticipate additional sequestration cutbacks toward the end of this fiscal year?

General SHELTON. Mr. Chairman, specifically there are two radars, missile warning radars, one of which is key to missile defense which we reduced the operating tempo on. In one case, we are operating at a lower power. In another case, we are operating for a reduced number of hours per day.

In the case of the one that is necessary for missile defense, we have continued to operate that one at full power because of the threat from North Korea. If that posture is sustained through the rest of the fiscal year, that is another $5 million I need to find in my budget somewhere.

We have taken down one-third of Space Fence receiver sites. So we have a reduced length of the Space Fence that goes across the southern United States.

We have reduced the sustainment dollars that are being spent on the legacy Defense Satellite Communications System constellation, wideband communications satellites, which means we will be slower to respond to problems. We will not do as much trending analysis, that sort of thing.

There are a host of other things across the command, but those are the big operational impacts, and then of course, the civilian furloughs that are upcoming.

Senator UDALL. Would you anticipate additional cutbacks if we do not, obviously, get our act together in the next fiscal year? But what I hear you saying is, yes, you see additional cutbacks.

General SHELTON. In the remainder of fiscal year 2013, I think we are on target with the exception of the $5 million I mentioned.

Senator UDALL. Okay.

General SHELTON. For fiscal year 2014, it all depends on the President's budget, of course, how that is enacted, whether or not we go into a Continuing Resolution, whether the Budget Control Act targets remain in place. All of that is yet to be determined.

Senator UDALL. Thanks for that further information.

Let me turn to the EELV. Senator Sessions mentioned it in his remarks.

As I understand it, you are working to bring new entrants into the medium and heavy lift launch market while assuring reliable access to space. Those two go hand-in-hand. I am interested in how

you will structure the contracts to account for launch services, including mission assurance and vehicle integration, in addition to the acquisition of the rocket itself.

As a follow-on, can you explain the difference in contracts between the launch providers in the current 50 core block buy and your plans for contracting in the next block buy past the current 50 cores?

General SHELTON. Yes, sir. Let me start with how we will work the leveling of the playing field, if you will.

We have not fully determined how we will do that because there was a very efficient mechanism of providing launch capability. With a single provider, you can look at providing launch capability from both coasts. We even fly crews back and forth between the coasts because that is the more efficient way to do business. So we provide the launch pads. We provide the crews. We provide all that under a launch contract that just sustains that capability. It is a level of effort capability, and then we buy individual boosters.

Trying to introduce new entrants with some sort of construct that is parallel so that there is not a competitive disadvantage, so to speak, for those new entrants is still a work in progress. We have not solved that yet, but we will. We will get to the place where we define what United Launch Alliance's (ULA) costs are versus a new entrant's costs so that they can compete head-to-head here in the future.

We will soon contract for the 36 cores, another 14 cores to be competed. ULA will be able to compete against any new entrants that are certified by that time, and then we will be in good shape for determining the most efficient, most reliable access to space.

Senator UDALL. Let me slip a final question in to you, General, and this is in reference to Buckley Airfield and the space-based infrared satellites (SBIRS). My understanding is we are now fielding that next generation, but the ground system has been lagging behind the satellites. What are your timelines in regards to bringing the ground system online at Buckley?

General SHELTON. Senator, that has had a very checkered history. When we had a Nunn-McCurdy breach in 2005, we went after the satellite, spent more money on the satellite system than we did on the ground system. So we knew this problem would exist, that the ground system would lag behind. But by 2016, we will have all this put back together.

We have full capability now to do what we need to do. It is in various locations, but it will all be combined in 2016.

Senator UDALL. Thank you.

Senator Sessions.

Senator SESSIONS. Thank you.

General Shelton, your comments related to what Ms. Chaplain was saying about the delay between the launch of a satellite and the ground system capability, can Congress fund your programs that have complicated your ability to have that come out in an effective timing sequence?

General SHELTON. Yes, sir. I would say that there are two factors. One is ground systems and satellites are typically contracted for independently, and trying to manage the technical risk and the

tempo of those programs independently is a challenge, trying to keep them on track going down the same schedule.

There are also funding challenges. As we run into difficulties, as we run into just normal fiscal challenges and there are reductions in the budget, that can slip one program out of sync with the other. So the only way that I know of to pull this all back together is manage it in one big contract, and that has its own challenges. I do not think what we have done is necessarily wrong. Keeping them together in a funding and schedule perspective has been a challenge.

Senator SESSIONS. I can see that. Sometimes DOD gets blamed for funding irregularities in Congress, and we should work really hard and you should keep us advised of extraordinary cost that might occur, particularly as we go through this sequestration dangerous period.

General Formica, a question involving prompt global strike which is dependent on space-related technologies. During the past missile defense testimony, you have highlighted the need for defensive and offensive capabilities to address the ballistic missile threat. I remain hopeful that a prompt global strike capability will provide this necessary offensive capability.

Can you provide a quick update on the progress of the advanced hypersonic weapon technology demonstration that is managed by your command? What are some of the strategic implications?

I felt like we have made this much more difficult. I felt like we could have used the original plan that was to use existing submarine-launched missiles, but that turned into a complication. So now we are on a more expensive track. How do you see it coming out and the value of it?

General FORMICA. Senator Sessions, thank you for the question.

As I have testified in the past to the subcommittee, we were successful in our first test of the advanced hypersonic weapon (AHW) in November 2011. We attributed that success to the great work of Sandia Lab and our partnership with the Aviation Missile Research Development and Engineer Center at the technology campus at Redstone Arsenal in Huntsville with our engineers from our technical center. We provided that test under the leadership of OSD's prompt global strike program.

It was successful. We believe that it has strategic and operational applications. Just from my narrow vantage point, I see it as a potential left-of-launch capability in the missile defense business. I spent yesterday at a missile defense symposium hosted by the Director of the Missile Defense Agency, and every one of the speakers talked about the need for offense-defense integration and attack ops to complement our missile defense capability. I see AHW has clearly a capability that has potential for application there.

We continue to work closely with OSD as we move towards a second flight test in fiscal year 2014. In fact, the Director of the Technology Center and my civilian deputy are meeting with OSD by Mr. Holter just today, and that is one of the subjects. The technology continues to advance, and we think we are on track to get ready for that test next year, sir.

Senator SESSIONS. Thank you very much.

To all of you, I am concerned that the President's budget does not identify the impacts of the sequester in the fiscal year 2014 budget. If the sequester is not averted, how will it impact the budget? We have a $52 billion assumption more in the President's $526 billion DOD budget. I believe it is $526 billion. But the current law is that the sequester takes effect, and if that takes effect, then the real budget you have to live with is $52 billion less. So I am really concerned about that.

Senator McCain and I, and others, asked a lot of questions about why we were not planning for this in advance on the assumption that it might happen. As a result, no serious planning was done, and you have had to make cuts in a very rapid situation.

The sequester is in law, signed by the President, voted for by Congress. We are not seeing the kind of movement I would like to see if we can avoid it. I am worried about that.

That is past my time. I will just leave it at that right now and just say that it is a matter of all of our concern. I know Senator Udall and we all care about it, but we are not making a lot of progress. I am afraid you definitely need to be seriously figuring how you are going to operate with less money than the President's budget assumes.

Senator UDALL. Thank you, Senator Sessions.

Senator Fischer.

Senator FISCHER. Thank you, Chairman Udall and Ranking Member Sessions. It is good to be with you again today.

Thank you for being here and being willing to answer some questions that we have for you.

General Shelton, I understand that the Air Force is exploring sensor disaggregation and hosting sensors on less expensive commercial satellites. Are you confident that that approach is going to work?

General SHELTON. Senator, we are actively studying that. It is not something where we have wholesale decided, but part of the savings that we have garnered from new acquisition approaches is being plowed into what we call space modernization initiative programs for advanced extremely high frequency, for SBIRS, and for Global Positioning System. That money goes to architectural studies to look at exactly what you are talking about. We will be a lot smarter by the summer. Right now, it is a bit in the study phase, but I would tell you from everything that I have seen so far, there is no reason not to be confident.

Senator FISCHER. How long have you been studying it?

General SHELTON. About 6 months now. We are just starting to scratch the surface of this.

We do have a hosted payload on orbit right now that is doing extremely well and is a trail-blazing effort. So that is part of the confidence, but also as we look at trying to establish resilience in our most important constellations, we know that we have to do something different. Whether that is disaggregation in terms of more numbers of satellites on orbit to make the targeting problem more difficult for an adversary, survivability concerns just from a premature failure point of view, all those sorts of things we are bringing into this equation to try to understand what is the best thing for the future.

Senator FISCHER. I would assume that if you do head in that direction, more satellites that you would be putting up would be less expensive and maybe less capable than the ones that you currently have up?

General SHELTON. In aggregate, we are not looking to reduce capability. As you look at each individual satellite, it would be less complex. It would be based on very mature technology and it would be smaller. So in theory—and again, part of the study effort—we think it would be less expensive to launch, less expensive to build, and less expensive to operate.

Senator FISCHER. Thank you.

Secretary Loverro, do you have anything to add on that?

Mr. LOVERRO. Senator Fischer, I think General Shelton has summed it up very well.

Disaggregation we view as one piece of the larger resiliency equation. There is no question that putting all of your eggs in a single basket, as we have in some of our satellite systems to date, does not present a resilient front to threats or even unintended consequences that we might see in the future.

There is certainly a large body of evidence that disaggregation can help us in this way, but it is not going to be the only thing that we use. Sometimes disaggregation is thought of as simply hosting a sensor on a commercial satellite. Disaggregation means allowing other nations to provide capability.

In a meeting a couple of days ago, we were talking about weather, which General Shelton and his team are running an analysis of alternatives on right now. It is interesting to note that our weather capabilities are comprised of contributions from well over 100 different sensors, and when you go ask the scientists who sit in the weather system which satellite contributes what piece of the weather, they cannot tell you. If the scientists who sit there cannot tell you, imagine the complexity an adversary would have in trying to eliminate our weather capability because they cannot tell either. They would have to either target 100 different sensors which would be cost-prohibitive, or they stop trying and look at other ways to deny that. Now, not that we are interested in having them look at other ways. But complicating the enemy's calculus is an absolute hallmark of the resiliency discussion that we have been having.

Senator FISCHER. Thank you.

Ms. Chaplain, have you looked at that at all through GAO? Do you know will it be less expensive? Have you looked at costs? Are you working on this? Are you in on the study?

Ms. CHAPLAIN. Yes. We have several studies that will be covering this issue. You will see them later this year. But these issues have been talked about in previous work, and I would say our work confirms these theoretical benefits. If you build satellites that are more executable, they are smaller, the timeframes are going to be shorter, the launch costs could go down.

But there are a couple of cautions here. Like even transitioning to a disaggregated scenario, costs could go up in the short term because you will need an overlap between the current structure and where you are going, and there could be startup costs to put a new infrastructure in place to support this different kind of architecture.

Then there are some other issues that just are risks, I think, that are associated with this kind of architecture. Interoperability. You have more satellites out there that have to work together. It is not just all on one package. Data fusion. That is where you are going to get your capability by bringing all these thing together. Both those things alone are not easy to achieve and have been difficult to achieve in the past. Modernizing control systems is another issue. Developing common interfaces and common standards. There has been slow progress on that front, and just the general broader issue of leadership fragmentation. Right now, it is difficult. You can see just coordinating user assets and ground systems and the satellite to deliver at one time—that is pretty difficult. If you get into a scenario where you have a lot of——

Senator FISCHER. I think you said it takes years sometimes before it is coordinated?

Ms. CHAPLAIN. Yes. So I think the fragmentation of leadership needs to be addressed to make this scenario work.

Senator FISCHER. Thank you very much.

Thank you, Mr. Chairman.

Senator UDALL. Thank you, Senator Fischer.

General Formica, let me turn to you. In the spirit of Senator Sessions' comment and also the question I asked to General Shelton, tell us, if you can, briefly how sequestration is affecting your operational capability.

General FORMICA. Thank you, Mr. Chairman, for that question.

Of course, sequestration and the fiscal realities impact all of our operations. We were somewhat relieved in our fiscal situation in fiscal year 2013 with the enactment of a fiscal year 2013 appropriation. That has taken some pressure off this year. I would add that the Army prioritized space and missile defense programs very high in its prioritization list. So as we were working our way through the impacts of the fiscal year 2013 budget, I think space and missile defense was accorded appropriate consideration by the Army.

That said, as Senator Sessions indicated, our fiscal year 2014 budget request does not yet reflect sequestration. We know that there will be some degradation from that budget request.

I anticipate two primary challenges to our program based on sequestration.

First, we are already delaying some of our training courses. I expect training readiness to be challenged in fiscal year 2014.

Then the second, as General Shelton mentioned in his opening statement, the impact on the civilian workforce. I am concerned about that, frankly, in four different areas.

First, you have the threat of a furlough beginning in June, which has caused angst in the force, and if it actually is executed will cause hardships to our civilians and will challenge our ability to meet our day-to-day operations.

Second, we have already implemented a hiring freeze, and that hiring freeze means that we are creating gaps in our civilian workforce because people continue to retire, move, get sick, and those gaps are not being backfilled because of the hiring freeze.

Third, we have eliminated our temporary and term civilians, and that means, in my view, the next generation of public servants that

we are trying to develop are no longer being nurtured at the entry level.

Then fourth and last, like with our military training programs, we have taken a reduction in the development of our civilian workforce and the dollars that are afforded to that. We are going to take some impact in the ability to continue to train the civilian workforce that we have.

Senator UDALL. Thank you for that update.

Let us turn to nanosatellites (nanosat). Senator Fischer talked with General Shelton about the Air Force's interest in this. Your command is credited with pioneering a number of low-cost, small nanosat programs such as the Kestrel Eye, which is an imaging satellite. Can you give us a perspective on where those programs are headed in the Army? Particularly, I wanted your thoughts—the Operational Responsive Space (ORS) program was chartered to pioneer many of these initiatives, and I know it was popular among its customers. Do you still value the overall program?

General FORMICA. Thank you, Mr. Chairman.

We do value the ORS program, and the warfighter continues to benefit from the space capabilities that they are providing.

That said, we see nanosat technology as a complementary space capability, and we are, in fact, developing that technology as part of a DOD joint technology capability development program, approved by DOD and funded by Congress. That nanosat technology is principally two different satellites, one for beyond-line-of-sight communications and one for imagery, the Kestrel Eye, as you mentioned. We are in the middle of that capability demonstration. We continue to make very good advances with the technology and are learning a lot from our engineering efforts. The Joint Capabilities Technology Demonstrations (JCTD) are, in fact, on track. We expect to be able to launch satellites in both categories, both from the communications satellite SNAP and Kestrel Eye next year.

Where they are going is at the end of the JCTD, there will be a joint military utility assessment, and we think that that is the time for DOD to assess the military utility of this technology and then to have a cost-benefit discussion as to where we go. My expectation is that if the technology works correctly, then we would advocate for it to ultimately become a program of record. But the time is not right yet for that. We need the joint military utility assessment to have that discussion.

Senator UDALL. Thank you for that update.

Let me turn to Senator Sessions.

Senator SESSIONS. Generals Shelton and Formica, earlier this month President Vladimir Putin announced his intention to build a system to neutralize space weapons. According to the press reports, Deputy Prime Minister Dmitry Rogozin has said that Russia will,"have the technical means by 2030 to counteract threats from space by other countries."

Do we know what the Russians are referring to there? Do you believe we require similar capabilities, and do you believe Russian efforts being referred to are defensive or offensive in nature?

General SHELTON. Senator, I do not know specifically what might be talked about there. In a different forum, we could talk about some other capabilities.

Senator SESSIONS. There could be some areas of classification that we should not talk about, I certainly acknowledge.

General SHELTON. But suffice it to say, there are nations—and I will just use the plural here—who are developing capabilities to counter our advantages in space, and we are doing what we need to do to address that.

Senator SESSIONS. General Formica, would you like to comment on that?

General FORMICA. I think General Shelton covered it, Senator Sessions. Thank you.

But, obviously, we would be concerned about any of those capabilities because we are fully dependent on space as we conduct operations on the ground.

Senator SESSIONS. Would you say, General Shelton, that the need for counterspace capabilities are increasing rather than decreasing today?

General SHELTON. I think everything that we have seen from a policy perspective, from an intelligence perspective, would lead us to believe that counterspace is a growing area for all of us.

Senator SESSIONS. Potential adversaries seem to be advancing their capabilities. Would you agree?

General SHELTON. I do.

Senator SESSIONS. The ORS concept—for a second year in a row, the budget request proposes a termination of the congressionally-established ORS Office. The budget proposes a termination of that.

How does DOD intend to fulfill short-term capability gaps quickly and inexpensively in the future? Now, I ask any of you. Maybe, Secretary Loverro, you want to start to comment on that.

Mr. LOVERRO. Thank you, Senator.

As you have articulated, the budget has zeroed the ORS program again.

Clearly, though, we received your message in the National Defense Authorization Act that passed this year, and DOD has taken steps to go ahead and establish both the executive committee called for in that Act and to move the ORS Office under the Space and Missile Systems Center under Air Force Space Command, reporting to General Shelton. So while we recognize that the budget reality that is in the President's budget does not reflect the direction that we have gotten from you, we do recognize that we do have to figure out how to go ahead and best manage ORS.

I think that is the key that we will be working on through the executive committee, is how do we add ORS to the host of capabilities I spoke with Senator Fischer about in terms of providing the resilience and reconstitution that we need in the future.

I will let General Shelton talk to any specifics beyond that.

Senator SESSIONS. Thank you.

General Shelton, we have talked about it for a long time. We thought it was a way to provide redundant, immediate, fairly quick response to a challenging situation, and we thought it would result in less expense. So do you have any comments on the Secretary's statements?

General SHELTON. Yes, sir. This is just a matter of how much budget we have. What we are trying to do is inculcate the ORS lessons learned into the mainstream programs at the Space and Mis-

siles Systems Center. Rather than having a dedicated office with a dedicated budget, we take those lessons learned and the disaggregated concepts, the hosted payload concepts, all those kinds of things are things that we have learned from our ORS experiences. It is mainstreaming what we learned.

Senator SESSIONS. Thank you.

Senator UDALL. Senator Fischer?

Senator FISCHER. Thank you, Mr. Chairman and Ranking Member Sessions.

General Shelton, if I can just follow up on Senator Sessions' comments here.

So we have zeroed out the budget. I think it is by 2016. Is that correct?

General SHELTON. Are you talking about counterspace, ma'am?

Senator FISCHER. Yes.

General SHELTON. Yes.

Senator FISCHER. You have said that it is going to be absorbed by other areas of the budget?

General SHELTON. No, ma'am. By 2016, the budget that you see has now gone into a sustainment program. It is in operation and maintenance funds, not in procurement funds. We have completed the procurement of that particular capability.

Senator FISCHER. So you believe that we do not need to expand or grow in that area anymore. We are just at operation and maintenance. Right?

General SHELTON. Ma'am, we would have to take this into another forum.

Senator FISCHER. Can you say what other forum at this point, or is that part of——

General SHELTON. It is beyond the classification of this session.

Senator FISCHER. Okay, thank you.

How would that compare, what we are now looking at doing in the future past 2016, to what other nations are doing—say, the Chinese—and the amount of money that they are throwing at these programs?

General SHELTON. Again, I am a little bit hamstrung here.

Senator FISCHER. Okay.

General SHELTON. I would love to sit down and talk to you in a closed session.

Senator FISCHER. Okay. I appreciate that. I am sorry that I headed in that direction. We will talk again. I will try another track. Okay?

You have command over both the Air Force's cyber and space forces, and I understand that you are going to be required to generate a large number of airmen in order to meet U.S. Cyber Command (CYBERCOM) needs. Is that correct?

General SHELTON. That is true. It is a little over 1,200.

Senator FISCHER. Have you identified a path forward towards providing for these forces, and do you have any concerns that cyber requirements may draw resources from your space requirements?

General SHELTON. We have not fully settled on exactly how the Air Force is going to fund those positions. It is going to happen. A little bit of an arm wrestling contest——

Senator FISCHER. It is going to happen or does it have to happen?

General SHELTON. It is direction to the Air Force. OSD said, Air Force, this is your share of the overall CYBERCOM manpower for specific purposes, and so the Air Force has direction to fund those. So there is no doubt in my mind. We will fund those. The precise mechanism for that has yet to be determined.

It will not come at the expense of space capability, though. It will not be a trade that is just given to me to fund, find this somewhere within your resources. It is an Air Force-wide problem.

Senator FISCHER. When you take into consideration the sequester and the cuts that you will be looking at, and when you look at the budget that was presented, which did not take into consideration the sequester, how are you going to make this work? Do you not have to take it from somewhere?

General SHELTON. It does. It has to come inside the top line of authorized manpower. It has to come from somewhere, and that will be the challenge that will occur at the Air Force corporate level, if you will, to try to determine where we find 1,200 positions to fund those cyber positions.

Senator FISCHER. But you are saying your preference would be not to take it from space?

General SHELTON. Not only my preference, but I am a strong advocate of not doing that.

Senator FISCHER. Thank you very much.

Thank you, Mr. Chairman.

Senator UDALL. Senator Fischer, that is an important line of questioning. In the last two NDAAs, I have explored what we could do to think of this as not a zero sum game, but maybe we and our teams could work together and work with the General and others because both functions are really crucial. But we do not want to rob Peter to pay Paul. I appreciate the General's wry smile in saying he is not going to give any quarter, given his responsibilities, but he knows the importance of cyber.

General Formica, let me come back with one final question for you. Kwajalein, an important little place out in the Pacific. Can you talk about how the site supports space situational awareness? It is your responsibility, as you well know.

General FORMICA. Yes, Mr. Chairman. Thank you.

Kwajalein, as you know from your question, is a strategic asset out in the middle of the South Pacific. The longer I have been in this command, the more I have come to appreciate the importance of Kwajalein, and therefore, the role I play as the senior commander there is one of the most important duties that I have actually. Kwajalein is a host to the Reagan Test Site, which is a national class test that host tests for missile defense, intercontinental ballistic missiles, and other tests that require the kind of space that Kwajalein Atoll affords.

We have very sophisticated radar capability out there, and those radars, when they are not being used for test, are made available for space situational awareness and to meet missions in support of U.S. Strategic Command (STRATCOM) and in direct support of the Joint Functional Component Command for space, which is subordinate to STRATCOM.

We provide space object identification and space situational awareness from those radars. We are strategically located in the

Pacific to identify space launch, and we soon will be the home for the Air Force's Space Fence.

Senator UDALL. Thank you for that update. You do underline the importance of that jewel of an asset.

Secretary Loverro, let me turn to you and we will talk space policy here. I understand you are new to your job, but that does not mean you are new to the topic. You come from the Air Force Space Command, Space and Missile Systems Center. Welcome. Thank you for, again, your willingness to serve.

What actions is DOD taking to ensure that we support some sort of rules-of-the-road, so to speak, with respect to space navigation between countries?

Mr. LOVERRO. Mr. Chairman, DOD has multiple activities ongoing in that regard. One was just mentioned by General Formica in terms of space situational awareness. Obviously, space situational awareness is fundamental to understanding what is going on in space. The Space Fence, which Air Force Space Command is going to put on Kwajalein, is a critical asset. But just as critical is our cooperative assets that we are looking at putting into Australia, the C-band radar that Air Force Space Command will be placing down there under an allied agreement. Those kinds of activities are firmly supported by DOD and are foundational to anything we do in terms of space traffic management and the freedom of space.

But it is more than just the technical capabilities. It is the agreement on what the rules-of-the-road are for space, how do you operate in space. I think we all understand that in any economic and commerce sphere, there are rules of operations, whether that is rules of the sea, rules of the airways. So rules of space we view in very much the same way, not in a legally binding way, not in a way that will constrain U.S. national security. In fact, one of the reasons DOD is intimately involved in this is to make sure we do not constrain national security as we move forward. Yet, we all recognize that good rules allow us to go ahead and detect irresponsible behavior on the part of others.

So we are engaged with both the European Union on the international code of conduct. We have a member from the Department of State, Secretary Rose, and the group of government experts to go ahead and talk about what should be the rules. Obviously, we remain very committed to working with our allies through multiple mechanisms to establish those rules. I think that covers most of it.

Senator UDALL. That is very helpful. You anticipated my question about Australia. That is important to get that on the record.

Let me follow on Senator Sessions' comments when it comes to those who are developing—we will put it in a politic way—an ability to deny access to space. What is our country's and DOD's policy when it comes to ensuring that we have safe access to space and the disaggregating of our assets we have been discussing? Does that help ensure the survivability of those space assets?

Mr. LOVERRO. I absolutely believe that it does. Our policy that was published in 2010, both the National Space Policy and the National Security Policy that followed in 2011, all recognize that not only do we garner great benefit from space, but that we have an inherent right of protection in space.

So there will be a mixture of capabilities both from a protective standpoint, a resilience standpoint that we look to put into our systems in the future and offensive actions we may need to take in order to assure that we are not threatened in our space capabilities. As General Shelton has already indicated, a lot of that we cannot talk about in this session here, but we absolutely believe our policy supports all of those actions.

Senator UDALL. We are going to work on, what I hear you saying, the political, diplomatic, economic fronts, but we are also not going to be shy about developing our defensive capabilities, and there is no reason we should not develop offensive capabilities as well to show we are serious. We are going to be tough, but we will be smart as well. We will hold out a hand, but we are also not going to have our access limited.

Mr. LOVERRO. Yes. Just like in any other area of warfare, we understand that it takes both sides of protection and offensive capability to ensure that the warfighters get what they need.

Senator UDALL. Thank you for that.

Senator Sessions.

Senator SESSIONS. Thank you all. It is difficult to overstate the importance of space and missile capability to our modern day defense capability. It is just so critical to it.

Mr. Secretary, I will just ask you one final question from me. The history of warfare has shown that virtually every code, every security system gets penetrated at some point or another. We are so dependent on communication through satellite guide and other things. We have the leaks and some private somewhere is intercepting the communications from the Ambassador to Russia to the Secretary of State. It is just hard to believe that that kind of thing could happen.

Do you believe we have given sufficient concern to the ability of adversaries to intercept and decode communications that we have?

Mr. LOVERRO. Senator, I think if you are asking, if I understand the question, as we decide how do we go ahead and host our satellite communications capabilities, do we recognize the potential vulnerabilities if we use satellite capabilities from other nations—is that the question?

Senator SESSIONS. I am also thinking about just the basic communications system in which we send information, data through satellites that could be intercepted giving our adversaries valuable information we would not want to be made public.

Mr. LOVERRO. Understood. Absolutely. In normal departmental policy, all of our satellite communications are encrypted to the best of our ability. Now, I will readily admit there are some places that that has not been able to be implemented, but that is certainly where we are going.

There are efforts underway within DOD to provide more protective capability to our warfighters. Some of the space modernization investments that General Shelton spoke about are aimed directly at that problem because we recognize the need for wideband communications that are protected is growing quickly, especially with the modern war systems that we have today, especially as we adopt a more continental United States-based capability for many of these controls. So we are very focused on assuring that we can pro-

vide the protective communications in the future. Those are not always available everywhere in the world today that we fight, but that is our bias.

Senator SESSIONS. There is a lot of technology out there and we have a lot of penetration of all kinds of systems that are occurring today, and cybersecurity has become a huge issue for us. I think it would be a mistake, as we spend large amounts of money developing our systems, if we do not give sufficient attention to security.

Thank you very much.

Senator UDALL. Thank you, Senator Sessions.

I am going to exercise my prerogative, Senator Fischer, with her understanding, to bring this portion of the hearing to a conclusion.

Although I did want to thank Ms. Chaplain for your insights when Senator Fischer asked questions. We will direct some additional questions to you particularly on the FAB–T situation. I know you have some real expertise there.

I did not want to leave the Navy with the impression that they either were forgotten or they were doing a perfect job. So I did want to ask Secretary Zangardi a brief question about the MUOS system. It is going to replace the so-called Ultra High Frequency follow-on system, which is known as UFO. How fragile is the current UFO system and will the MUOS system be able to backstop the UFO as it ages out?

Dr. ZANGARDI. Yes, sir. Right now, MUOS–1 contains two packages. It contains a WCDMA package and a legacy UFO package. When UFO number 4 failed last year, we activated operationally the UHF package on board MUOS–1. It has provided backstop.

But let me back up a little bit more into this question. The UFO constellation provides a UHF communications capability to the joint warfighter. The Navy plans on meeting the joint staff legacy UHF requirement until MUOS full operational capability which occurs in 2017. Statistical reliability analysis has shown that the current UFO constellation plus the legacy payloads and other mitigating efforts will maintain the legacy UHF requirements for satellite communications through 2017 and probably beyond 2018. Other mitigation efforts include a host of payloads and leased satellite capability.

Presently right now, we have an additional 111 channels above the capability, which is the rough equivalent of about three UFO satellites. We believe that despite the age or fragility of the existing UFO constellation, we have sufficient capability to backstop.

Senator UDALL. Thank you for that update. We will ask some follow-on questions. Again, for the record, I want it to be shown that Senator Fischer and I have a lot of sailors in our States. We appreciate what the Navy does. In fact, Admiral Winnefeld headed U.S. Northern Command before he moved over to the Joint Chiefs. Thank you for what you do. We would not be anywhere without the Navy corpsmen and corpswomen. Thank you for being here today.

Thanks to the entire panel. We will excuse you and we will ask the second panel to join us. [Pause.]

Gentlemen, welcome. We will go right to, if it is okay with all of you, a 1- to 2-minute statement, and then we will move right to questions.

Major General Wheeler has joined us. Major General, the floor is yours.

STATEMENT OF MAJ. GEN. ROBERT E. WHEELER, USAF, DEPUTY CHIEF INFORMATION OFFICER FOR COMMAND, CONTROL, COMMUNICATIONS, AND COMPUTERS AND INFORMATION INFRASTRUCTURE CAPABILITIES; OFFICE OF THE SECRETARY OF DEFENSE

General WHEELER. Senator Udall, it is good to be back here again. I appreciate your having me here today. I will be quick this morning. I have also brought my full statement, which is sitting out in the other room there that goes into much more depth.

Senator UDALL. We will put it in the record, without objection. Thank you.

General WHEELER. Sir, thank you for the opportunity today to testify before the subcommittee regarding the vital importance of scarce radio frequency spectrum to U.S. national defense capabilities, the economy, and consumers.

I will make this statement short, highlighting the key points from my full formal written statement that I have already provided for the record, and leave the rest of the time for questions, as we have discussed.

Spectrum is a critical enabler that ensures information is dependably available to train our military forces and ensure safe and successful mission accomplishment. Within DOD, we understand that the strength of our Nation is rooted in the strength of our economy. In that regard, we remain fully committed in support of the national economic and security goals of the President's 500 megahertz initiative, the implementation of more effective and efficient use of this finite radio spectrum and the development of solutions to meet these goals is equally important to both national security and economic goals. We understand that.

DOD continues to cooperatively work with the National Telecommunications and Information Administration (NTIA), other administrative partners, and industry to develop the information required to ensure balanced spectrum repurposing decisions that are technically sound and operationally viable from a mission perspective.

The ability to operate spectrum-dependent national security capabilities without causing and receiving harmful interference, while understanding the critical need of our Nation's economy, remains paramount to DOD. DOD also recognizes the importance of the growing need for spectrum for economic development, technological innovation, and consumer demand. However, any repurposing decisions made without proper technical, operational, and cost impact assessment could preempt critical requirements and could cause adverse impact to military training operations and readiness. No spectrum repurposing decision is without risk, but risks can and must be managed. Together we will develop long-term solutions to achieving a balance between national security spectrum requirements and meeting the expanding demand of commercial broadband services.

Thank you, sir.

[The prepared statement of General Wheeler follows:]

PREPARED STATEMENT BY MAJ. GEN. ROBERT E. WHEELER, USAF

INTRODUCTION

Good morning Mr. Chairmen and distinguished subcommittee members. Thank you for the opportunity to testify before the Subcommittee regarding the vital importance of scarce radio frequency spectrum to U.S. national defense capabilities, the economy, and consumers. My name is Major General Robert Wheeler and I am the Deputy Chief Information Officer for Command, Control, Communications, and Computers (C4) and Information Infrastructure Capabilities. My testimony today will focus on the importance of spectrum to the Department of Defense (DOD) in ensuring that our warfighters and mission partners have the critical capabilities they need to prepare for and execute the missions assigned to them by the Commander in Chief as safely and effectively as possible.

IMPORTANCE OF SPECTRUM TO DOD

The DOD remains fully committed in support of the national economic and security goals of the President's 500 MHz initiative to make spectrum available for commercial broadband use, the implementation of more effective and efficient use of this finite radio-frequency spectrum and the development of solutions to meet these goals while ensuring national security and other Federal capabilities are preserved. Spectrum has become increasingly important to the Department's missions, consumers, and the economy of the Nation as a whole.

Military spectrum requirements are diverse and complex given the variety of different missions the Department must support around the world. DOD uses spectrum for command and control operations, communications, intelligence, surveillance, and target acquisition, on land, at sea, in the air and in space. In the United States, our systems utilize spectrum in order to properly train as we must fight.

For example, the Air Combat Training System (ACTS) uses the federally allocated and regulated 1755–1850 MHz band to support combat readiness pilot certification through robust United States aircrew training along with crews from allied countries. The system is used at training ranges and bases across the United States with over 10,000 training flights per month. ACTS is also used for 10–12 large Carrier Strike Group exercises annually, where it is used 24 by 7 for up to 6 weeks in duration.

In short, spectrum is the critical enabler that ensures information is dependably available to train our forces and ensure safe and successful mission accomplishment.

The Department, like the rest of the country and world, also has growing requirements resulting from our increasing reliance on spectrum-dependent technologies. An example is the Department's use of unmanned aerial systems (UAS) requires spectrum to process volumes of critical intelligence, surveillance, and reconnaissance data in support of our missions in military areas of operation. Our inventory of UAS platforms has increased from 167 in 2002 to nearly 7,500 in 2010. This has resulted in a dramatic increase in UAS use and training requirements, and consequently an increase in demand for spectrum to adequately satisfy those missions.

While the Department critically depends on wireless and information technology that require spectrum, DOD is cognizant of the scarcity of this resource and its importance to the economic well-being of our Nation. When referencing the U.S. Frequency Allocation chart, and using the strict interpretation of the allocations, one will find in spectrum between 225 and 3,700 MHz 18 percent Federal exclusive use, 33 percent non-Federal exclusive use, and 49 percent Federal/non-Federal shared use. When you apply real-world factors for how spectrum is actually used within the United States, these numbers will vary, but they do illustrate the fact that there is not a significant gap between the amount of spectrum allocated to Federal and non-Federal/commercial users. Even within spectrum allocated for exclusive Federal use, the majority of the spectrum is shared between DOD and all of the other Federal agencies, across a wide array of systems, performing a multitude of varied missions, often with very different technologies.

As noted above, the Department also recognizes the importance of the growing needs for spectrum for economic development, technology innovation and consumer services. Within the DOD, we understand that the strength of our Nation is rooted in the strength of our economy in harmony with the strength of our national security. We are dependent on industry for innovative products that can be used for national security.

The Department continues to work with the National Telecommunications and Information Administration (NTIA), other administration partners, and industry to develop the information required to ensure balanced spectrum repurposing decisions that are technically sound and operationally viable from a mission perspective. The

results so far have been promising. For instance, in support of the President's 500 MHz initiative, the initial frequency band assessment, commonly referred to as the "fast track study," resulted in arrangements to geographically share the 1695–1710 and 3550–3650 MHz bands. The reallocation feasibility assessment of the 1755–1850 MHz band also marks another important step. NTIA concluded in its assessment report that while there are significant challenges yet to overcome, it is possible to repurpose all 95 MHz of spectrum, based on the conditions outlined in the report. DOD is fully engaged in addressing these challenges, by closely working with industry to evaluate sharing possibilities.

In general, in order to avoid critical mission impacts and maintain comparable capability, there are three things the DOD requires if we are to relocate our systems out of spectrum to be repurposed for wireless broadband; cost reimbursement, sufficient time, and, if necessary, alternate spectrum with comparable technical characteristics to restore lost capabilities (note Public Law 106–65).

Existing statutes provide for relocation and sharing costs to be reimbursed through the Spectrum Relocation Fund, using auction revenue. Auction revenues by law must meet 110 percent of the estimated Federal relocation costs for the auction to go forward. During the Department's study of the 1755–1850 MHz band relocation feasibility, the Service Cost Agencies led the development of cost estimates for their respective systems, while the entire process was led and overseen by the Department's independent Cost Assessment and Program Evaluation (CAPE) organization to ensure consistency in methodologies and assumptions. The costs to modify or replace existing systems to use the identified comparable spectrum (e.g., 2025–2110 MHz, 5150–5250 MHz) were included in the analysis. NTIA report shows total cost for all Federal agencies is about $18 billion, approximately $13 billion is DOD's cost. Any affected systems planned to be retired or already programmed to be replaced within the 10-year transition period (e.g., Air Force Precision Guided Munitions and Army Explosive Ordinance Disposal robots) were excluded. The Service Cost Agencies interviewed technical experts associated with each of the major systems to understand what components needed modification, made site visits to major test and training ranges to view the actual equipment, and gathered cost data for similar modifications and new components where available. The cost estimates were peer-reviewed through the respective Service Cost Agencies and reviewed again by CAPE and the DOD Chief Information Officer.

Sufficient time to relocate systems from the 1755–1850 MHz band is dependent upon the schedule of developing and deploying alternative capabilities, and can vary from a few years for simple systems with readily available alternatives, up to 10 years for more complex systems, and upwards of 30 years for space systems, where modification is not an option.

The last requirement is maintaining comparable capabilities. This includes alternate spectrum with comparable technical characteristics to relocate systems into, i.e., spectrum with the physical properties to support the missions currently being performed in the 1755–1850 MHz band. With the finite nature of spectrum, and growing requirements, this has become a tough requirement to meet.

Let me also address the issue of the lower 25 MHz or the 1755–1780 MHz band. We fully understand the desire to bring this 25 MHz to market rapidly, particularly with a potential pairing band called out for auction within 3 years in the Middle Class Tax Relief and Job Creation Act, but the Department has some significant reservations. As we worked within NTIA's established process to identify the 500 MHz directed by the President, the Federal agencies, including DOD, were instructed to study reallocation of the entire 95 MHz band. Thus, a detailed study of vacating solely the lower 25 MHz has not been conducted, and the results of the full 95 MHz band study cannot be extrapolated to a solution for just the lower 25 MHz. Further, it is important that DOD understand the long-term status of the full band as part of any decision on the lower 25 MHz, in order to fully understand the impacts on DOD warfighting missions and cost implications of any relocation. In order to make balanced decisions about relocating from or sharing spectrum, the Department requires adequate time to conduct operational, technical, cost and schedule-feasibility analysis to ensure national security and other Federal capabilities are preserved, while supporting the economic benefits spectrum use affords the Nation. These studies are critical to preserving the warfighting advantages our weapons systems provide so that our soldiers, sailors, airman, and marines can perform their missions with the greatest possible advantage over our adversaries, and return home to their loved ones safely.

Recognizing the relocation challenges, focus is shifting to spectrum sharing as a potential option for repurposing spectrum bands for commercial wireless broadband use.

The Department has and is continuing to work with NTIA and the Federal Communications Commission (FCC) to determine ways to share spectrum with commercial users when possible. Recent successes include the FCC's new rules which allow Dish networks to roll out a Broadband network across the country in the 2180–2200 MHz band adjacent to the 2200–2290 MHz band that is critical to our satellite communications downlink and aeronautical mobile telemetry testing, yet collectively DOD and Dish were able to establish the rules to permit this new use to enter the band without risk of harmful interference. We are also working with the FCC and NTIA to explore ways to share the 3550–3650 MHz and 5GHz bands as well for commercial broadband use. To date we have identified ~400 MHz of Federal spectrum for potential commercial broadband use.

While large-scale spectrum sharing between Federal systems and commercial licensed cellular broadband services presents new challenges, DOD is committed to working with government and industry partners to develop equitable spectrum sharing solutions. DOD is actively supporting efforts through NTIA-established working groups under its Commerce Spectrum Management Advisory Committee (CSMAC) to further the 1755–1850 MHz band assessment, working with interagency partners, NTIA, FCC, and industry. The main focus of the evaluation is to determine the feasibility of sharing the 1755–1850 MHz band versus relocation. DOD is also cooperatively working with three major wireless providers to evaluate sharing the 1755–1850 MHz band including spectrum monitoring at selected DOD sites as well as modeling, simulation and analysis to develop an understanding of the sharing environment in the band. Results will inform the NTIA CSMAC working groups. These efforts are also examples of an unprecedented collaboration between the DOD and the commercial industry to assess highly complex technical issues with a goal of ensuring practical and balanced spectrum repurposing decisions that are technically sound and operationally viable from a mission perspective.

DOD recognizes the need to look forward. The Department is developing a spectrum strategy focused on investing in technologies and capabilities aimed at more efficient use and management of spectrum, and for increased interoperability with our Coalition partners and with Federal, State, and commercial entities.

SUMMARY

The ability to have assured access to spectrum in order to operate spectrum-dependent national security capabilities without causing and receiving harmful interference while understanding the critical needs of our Nation's economy remains paramount to the Department. The Federal Government and our industry partners have built an impressive team that is working toward solving the technical and policy issues so we can move ahead. Together, we will develop long-term solutions to achieving a balance between national security spectrum requirements and meeting the expanding demand of commercial broadband services.

I want to thank you for your interest in hearing the importance of spectrum to DOD.

Senator UDALL. Thank you, General. Again, for the record, let me acknowledge your role as the Deputy Chief Information Officer for Command, Control, Communications, and Computers and Information Infrastructure Capabilities on the staff of the Secretary of Defense, and you are a member of the U.S. Air Force. So again, welcome.

General WHEELER. Thank you, sir.

Senator UDALL. We also have Mark L. Goldstein, who is the Director of Physical Infrastructure at the GAO. Welcome, Mr. Goldstein. We look forward to your comments.

STATEMENT OF MR. MARK L. GOLDSTEIN, DIRECTOR, PHYSICAL INFRASTRUCTURE, GOVERNMENT ACCOUNTABILITY OFFICE

Mr. GOLDSTEIN. Thank you, Mr. Chairman and members of the subcommittee. Thank you for inviting GAO to testify on the issue of past spectrum auctions and the potential cost of moving some Government functions off certain spectrum bands. This testimony

addresses our preliminary findings and report to be issued in several weeks to this committee.

Our review found the following.

First, actual cost to relocate some Federal users from the 1710–1755 megahertz band have exceeded the original $1 billion estimate by about $474 million as of March 2013. In contrast, DOD expects to complete relocation for about $275 million, or approximately $80 million less than its $355 million estimate. The relocation of systems from this band has been less expensive than originally estimated because many systems were simply retuned to operate in the adjacent 1755 to 1850 megahertz band.

Second, DOD's preliminary cost estimate for relocating systems from the 1755 to 1850 megahertz band substantially or partially met GAO's best practices, but changes in key assumptions may affect future costs. Most importantly, decisions about which spectrum band DOD would relocate to are still unresolved. Nevertheless, DOD's cost estimate was consistent with its purpose of informing the decision to make additional spectrum available for commercial wireless services.

Third, no Government revenue forecast has been prepared for a potential auction of licenses in the 1755 to 1850 megahertz band, and a variety of factors could influence auction revenues. The price of spectrum and ultimately auction revenue is determined by supply and demand. Several factors would influence profitability and demand, including whether the spectrum is cleared to Federal users or must be shared.

Thank you, Mr. Chairman. I would be happy to respond to questions later.

[The prepared statement of Mr. Goldstein follows:]

PREPARED STATEMENT BY MR. MARK L. GOLDSTEIN

Chairman Udall, Ranking Member Sessions, and members of the subcommittee: Thank you for the opportunity to be here today as the subcommittee examines the Department of Defense's (DOD) requirements for radio frequency spectrum.[1] DOD requires spectrum to support military operations, testing, and training at home and around the world. For example, DOD has dramatically increased its use of unmanned aerial systems in support of overseas missions; these systems require spectrum to transmit volumes of critical intelligence, surveillance, and reconnaissance data, leading to an increase in DOD's demand for spectrum. Similarly, as the demand for and use of smart phones, tablets, and other wireless devices continues to grow, commercial requirements for spectrum are expanding as well, with important implications for economic growth. Thus, balancing competing industry and government demands for a limited amount of spectrum, today and in the future, is a challenging and complex task.

In June 2010, the administration issued a presidential memorandum directing the National Telecommunications and Information Administration (NTIA) to collaborate with the Federal Communications Commission (FCC) to make available a total of 500 MHz of Federal and nonFederal spectrum for wireless broadband within 10 years.[2] As part of this effort, DOD studied the feasibility of relocating military sys-

[1] The radio frequency spectrum is the part of the natural spectrum of electromagnetic radiation lying between the frequency limits of 3 kilohertz (kHz) and 300 gigahertz (GHz). Radio frequencies are grouped into bands and are measured in units of Hertz, or cycles per second. The term kHz refers to thousands of Hertz, megahertz (MHz) to millions of Hertz, and GHz to billions of Hertz. The Hertz unit of measurement is used to refer to both the quantity of spectrum (such as 500 MHz of spectrum) and the frequency bands (such as the 1755–1850 MHz band).

[2] See, Memorandum for the Heads of Executive Departments and Agencies, Unleashing the Wireless Broadband Revolution, 75 Fed. Reg. 38387 (June 28, 2010).

tems from the 1755–1850 MHz band,[3] which is ideally suited to enabling highly mobile, yet reliable communication links for commercial and Federal users. Relocating to other parts of the radio frequency spectrum means that many of these military systems would need to be redesigned. In addition, few other comparable spectrum bands are available that can effectively support the Federal operations currently in the band. In September 2011, DOD estimated that the cost to relocate most military systems from the 1755–1850 MHz band would be about $12.6 billion over 10 years.

My statement today discusses our ongoing review, requested by the Senate Committee on Armed Services, of Federal agencies' spectrum relocation costs and auction revenues. Our review focuses on (1) the differences between estimated and actual Federal relocation costs, and revenue from the auction of the 1710–1755 MHz band; (2) the extent to which DOD followed best practices to prepare its preliminary cost estimate for vacating the 1755–1850 MHz band and the limitations, if any, of its analysis; and (3) what government or industry revenue forecasts exist for an auction of the 1755–1850 MHz band, and what factors, if any, could influence the actual auction revenue. To determine the estimated and actual Federal relocation costs, and revenue from the auction of the 1710–1755 MHz band, we reviewed annual progress reports for the 1710–1755 MHz transition published by NTIA and spectrum auction data published by FCC as of December 2012.[4] We limited our analysis to the Advanced Wireless Services-1 (AWS–1) auction involving the 1710–1755 MHz band; this is the only spectrum auction involving Federal agencies, including DOD, with significant, known relocation costs.[5] To assess whether the cost of vacating the 1755–1850 MHz band is sufficiently captured in DOD's preliminary cost estimate, we assessed DOD's preliminary estimate against GAO's Cost Estimating and Assessment Guide (Cost Guide), which has been used to evaluate cost estimates across the government;[6] these best practices help ensure cost estimates are comprehensive, well-documented, accurate, and credible. To identify any limitations affecting DOD's estimate, we also interviewed DOD officials responsible for developing the department's preliminary cost estimate. To identify any government or industry forecasts of revenue from a future auction of the 1755–1850 MHz band and any factors that would affect the value of spectrum licenses, we reviewed academic, government, and public policy literature. We also interviewed officials from the Congressional Budget Office (CBO) and the Office of Management and Budget (OMB), and stakeholders with knowledge of spectrum licensing issues, including industry and policy experts. We are conducting our work 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. We plan to issue our final report on this work in May 2013.

BACKGROUND

The radio frequency spectrum is the resource that makes possible wireless communications and supports a vast array of government and commercial services. DOD uses spectrum to transmit and receive critical voice and data communications involving military tactical radio, air combat training, precision-guided munitions, unmanned aerial systems, and aeronautical telemetry and satellite control, among others. The military employs these systems for training, testing, and combat operations throughout the world. Commercial entities use spectrum to provide a variety of wireless services, including mobile voice and data, paging, broadcast television and radio, and satellite services.

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[3] Within the United States, this band is allocated exclusively to the Federal Government, particularly for defense purposes, such as military tactical communications, air combat training, and space systems.

[4] To assess the reliability of the relocation cost and auction revenue data, we reviewed documentation related to the data, compared the data to other sources, including government reports, and discussed the data with FCC and NTIA officials. We determined that the FCC and NTIA data were sufficiently reliable for our purposes.

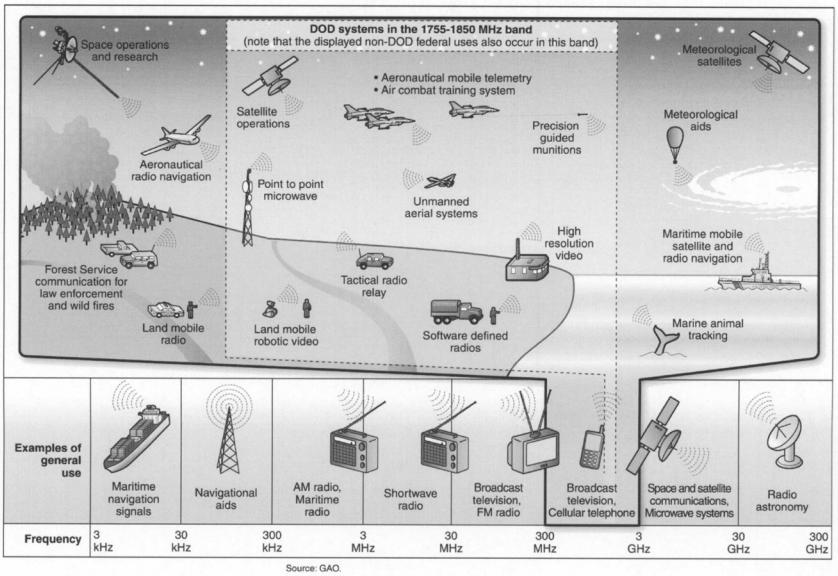
[5] There have been other auctions involving the relocation of Federal Government agencies. For example, the National Oceanic and Atmospheric Administration (NOAA), Air Force, and National Science Foundation previously operated systems in the 1670–1675 MHz band. The estimated cost to relocate these systems was $35–55 million for NOAA and $515,000 for the Air Force. See NTIA, Spectrum Reallocation Final Report: Response to Title V—Omnibus Budget Reconciliation Act of 1993 (Washington, DC: February 1995). FCC auctioned the band in April 2003, and the auction generated $12.6 million. Final relocation costs are unclear.

[6] GAO, GAO Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs, GAO–09–3SP (Washington, DC: March 2009).

In the United States, FCC manages spectrum for nonFederal users under the Communications Act,[7] while NTIA manages spectrum for Federal Government users and acts for the President with respect to spectrum management issues as governed by the National Telecommunications and Information Administration Organization Act.[8] FCC and NTIA, with direction from Congress and the President, jointly determine the amount of spectrum allocated for Federal, nonfederal, and shared use. FCC and NTIA manage the spectrum through a system of frequency allocation and assignment.

- Allocation involves segmenting the radio spectrum into bands of frequencies that are designated for use by particular types of radio services or classes of users. (Fig. 1 illustrates examples of allocated spectrum uses, including DOD systems using the 1755–1850 MHz band.) In addition, spectrum managers specify service rules, which include the technical and operating characteristics of equipment.

Figure 1: Examples of Allocated Spectrum Uses and DOD Systems Using the 1755-1850 MHz band



Source: GAO.

- Assignment, which occurs after spectrum has been allocated for particular types of services or classes of users, involves providing users, such as commercial entities or government agencies, with a license or authorization to use a specific portion of spectrum. FCC assigns licenses within frequency bands to commercial enterprises, state and local governments, and other entities. Since 1994, FCC has used competitive bidding, or auctions, to assign certain licenses to commercial entities for their use of spectrum.[9] Auctions are a market-based mechanism in which FCC assigns a license to the entity that submits the highest bid for specific bands of spectrum. NTIA authorizes spectrum use through frequency assignments to Federal agencies. More than 60 Federal agencies and departments combined have over 240,000 frequency assignments, although 9 departments, including DOD, hold 94 percent of all frequency assignments for Federal use.

Congress has taken a number of steps to facilitate the deployment of innovative, new commercial wireless services to consumers, including requiring more Federal

[7] Communications Act, 47 U.S.C. § 309.
[8] Pub. L. No. 102–538, title I, 106 Stat. 3533, codified as amended at 47 U.S.C. ch. 8.
[9] Not all licenses are assigned via auctions. For example, in some frequency bands, FCC authorizes unlicensed use of spectrum—that is, users do not need to obtain a license to use spectrum. Rather, an unlimited number of unlicensed users can share frequencies on a noninterference basis. Thus, the assignment process does not apply to the use of unlicensed spectrum.

spectrum to be reallocated for commercial use. Relocating communications systems entails costs that are affected by many variables related to the systems themselves as well as the relocation plans. Some fixed microwave systems, for example, can use off-the-shelf commercial technology and may just need to be re-tuned to accommodate a change in frequency. However, some systems may require significant modification if the characteristics of the new spectrum frequencies differ sufficiently from the original spectrum. Specialized systems, such as those used for surveillance and law enforcement purposes, may not be compatible with commercial technology, and therefore agencies have to work with vendors to develop equipment that meets mission needs and operational requirements.

In 2004, the Commercial Spectrum Enhancement Act (CSEA) established a Spectrum Relocation Fund,[10] funded from auction proceeds, to cover the costs incurred by Federal entities that relocate to new frequency assignments or transition to alternative technologies.[11] The auction of spectrum licenses in the 1710–1755 MHz band was the first with relocation costs to take place under CSEA. Twelve agencies previously operated communication systems in this band, including DOD. CSEA designated 1710–1755 MHz as "eligible frequencies" for which Federal relocation costs could be paid from the Spectrum Relocation Fund.[12] In September 2006, FCC concluded the auction of licenses in the 1710–1755 MHz band and, in accordance with CSEA,[13] a portion of the auction proceeds is currently being used to pay spectrum relocation expenses.[14]

In response to the President's 2010 memorandum requiring that additional spectrum be made available for commercial use within 10 years, in January 2011, NTIA selected the 1755–1850 MHz band as the priority band for detailed evaluation and required Federal agencies to evaluate the feasibility of relocating systems to alternative spectrum bands. DOD provided NTIA its input in September 2011, and NTIA subsequently issued its assessment of the viability for accommodating commercial wireless broadband in the band in March 2012.[15] Most recently, the President's Council of Advisors on Science and Technology published a report in July 2012 recommending specific steps to ensure the successful implementation of the President's 2010 memorandum.[16] The report found, for example, that clearing and vacating Federal users from certain bands was not a sustainable basis for spectrum policy largely because of the high cost to relocate Federal agencies and disruption to the Federal missions. It recommended new policies to promote the sharing of Federal spectrum. The sharing approach has been questioned by CTIA—The Wireless Association and its members,[17] which argue that cleared spectrum and an exclusive-use approach to spectrum management has enabled the U.S. wireless industry to invest hundreds of billions of dollars to deploy mobile broadband networks resulting in economic benefits for consumers and businesses.

SOME AGENCIES UNDERESTIMATED 1710–1755 MHZ BAND RELOCATION COSTS, ALTHOUGH AUCTION REVENUES APPEAR TO EXCEED THOSE COSTS

Some Federal Agencies Underestimated Relocation Costs

Actual costs to relocate communications systems for 12 Federal agencies from the 1710–1755 MHz band have exceeded original estimates by about $474 million, or 47 percent, as of March 2013. The original transfers from the Spectrum Relocation Fund to agency accounts, totaling over $1 billion, were made in March 2007. Subsequently, some agencies requested additional monies from the Spectrum Relocation Fund to cover relocation expenses. Agencies requesting the largest amounts of subsequent transfers include the Department of Justice ($294 million), the Department

[10] 47 U.S.C. § 928.

[11] Eligible relocation expenses are those costs incurred by a Federal entity to achieve comparable capability of systems, regardless of whether that is achieved by relocating to a new frequency assignment or utilizing an alternative technology. 47 U.S.C. § 923(g)(3).

[12] 47 U.S.C. § 923(g)(2).

[13] 47 U.S.C. § 928(d)(1), appropriates from the Spectrum Relocation Fund such sums as may be required to pay authorized relocation or sharing costs. See, also 47 U.S.C. § 928(c).

[14] This auction included licenses in the 1710–1755 MHz and 2110–2155 MHz bands. In August 2008, FCC held a second auction of the licenses that were not sold in the first auction.

[15] NTIA, An Assessment of the Viability of Accommodating Wireless Broadband in the 1755–1850 MHz Band (Washington, DC: March 2012).

[16] Executive Office of the President, President's Council of Advisors on Science and Technology, Report to the President: Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth (Washington, DC: July 2012).

[17] CTIA—The Wireless Association is an international nonprofit membership organization that has represented the wireless communications industry since 1984. Membership in the association includes wireless carriers and their suppliers, as well as providers and manufacturers of wireless data services and products.

of Homeland Security ($192 million), the Department of Energy ($35 million), and the U.S. Postal Service ($6.6 million). OMB and NTIA officials expect the final relocation cost to be about $1.5 billion compared with the original estimate of about $1 billion. Total actual costs exceed estimated costs for many reasons, including unforeseen challenges, unique issues posed by specific equipment location, the transition timeframe, costs associated with achieving comparable capability, and the fact that some agencies may not have properly followed OMB and NTIA guidance to prepare the original cost estimate. NTIA reports that it expects agencies to complete the relocation effort between 2013 and 2017.

Although 11 of the 12 agencies plan to spend the same amount or more than they estimated, DOD expects to complete the 1710–1755 MHz transition for about $275 million, or approximately $80 million less than its cost estimate. DOD's cost estimates, some made as early as 1995, changed over time as officials considered different relocation scenarios with differing key assumptions and their thinking evolved about the systems that would be affected, according to DOD and NTIA officials. Cost estimates to relocate military systems from the late 1990s and early 2000s ranged from a low of $38 million to as much as $1.6 billion, depending on the scenario. DOD's final cost estimate to relocate from the band was about $355 million. DOD officials told us that the relocation of systems from the 1710–1755 MHz band has been less expensive than originally estimated because many of its systems were simply re-tuned to operate in the 1755–1850 MHz band.

Auction Revenues Appear to Exceed Agency Relocation Costs

The auction of the 1710–1755 MHz band raised almost $6.9 billion in gross winning bids from the sale of licenses to use these frequencies.[18] This revenue minus the expected final relocation costs of approximately $1.5 billion suggests that the auction of the band will raise roughly $5.4 billion for the U.S. Treasury. As mentioned above, NTIA reports that it expects agencies to complete the relocation effort between 2013 and 2017; therefore, the final net revenue amount may change. For example, the Department of the Navy has already initiated a process to return almost $65 million to the Spectrum Relocation Fund.

DOD'S PRELIMINARY COST ESTIMATE SUBSTANTIALLY OR PARTIALLY MET GAO'S IDENTIFIED BEST PRACTICES, BUT CHANGES IN ASSUMPTIONS MAY AFFECT FUTURE COSTS

DOD's Preliminary Cost Estimate for Relocating from the 1755–1850 MHz Band Substantially or Partially Met GAO's Identified Best Practices

DOD's Office of Cost Assessment and Program Evaluation (CAPE)[19] led the effort to prepare the department's preliminary cost estimate portion of its study to determine the feasibility of relocating its 11 major radio systems from the 1755–1850 MHz band. To do so, CAPE worked closely with cost estimators and others at the respective military services regarding the technical and cost data needed to support the estimate and how they should be gathered to maintain consistency across the services. The services' cost estimators compiled and reviewed the program data, identified the appropriate program content affected by each system's relocation, developed cost estimates under the given constraints and assumptions, and internally reviewed the estimates consistent with their standard practices before providing them to CAPE. CAPE staff then reviewed the services' estimates for accuracy and consistency, and obtained DOD management approval on its practices and findings. According to DOD officials, CAPE based this methodology on the cost estimation best practices it customarily employs.

We reviewed DOD's preliminary cost estimation methodology and evaluated it against GAO's Cost Guide, which also identifies cost estimating best practices that help ensure cost estimates are comprehensive, well-documented, accurate, and credible. These characteristics of cost estimates help minimize the risk of cost overruns, missed deadlines, and unmet performance targets:

- A comprehensive cost estimate ensures that costs are neither omitted nor double counted.
- A well-documented estimate is thoroughly documented, including source data and significance, clearly detailed calculations and results, and explanations for choosing a particular method or reference.

[18] Although the AWS–1 auction of spectrum licenses raised $13.7 billion, the portion of the auction proceeds associated with the transferred government spectrum amounted to almost $6.9 billion and was deposited in the Spectrum Relocation Fund.

[19] The Director of Cost Assessment and Program Evaluation (CAPE) is a principal staff assistant and advisor to the Secretary of Defense and Deputy Secretary of Defense in the Office of the Secretary of Defense.

- An accurate cost estimate is unbiased, not overly conservative or overly optimistic, and based on an assessment of most likely costs.
- A credible estimate discusses any limitations of the analysis from uncertainty or biases surrounding data or assumptions.

DOD officials developed the preliminary cost estimate as a less-rigorous, "rough-order-of-magnitude" cost estimate[20] as outlined by NTIA, not a budget-quality cost estimate. Because of this, we performed a high-level analysis, applying GAO's identified best practices to DOD's cost estimate and methodology, and did not review all supporting data and analysis.

Overall, we found that DOD's cost estimate was consistent with the purpose of the feasibility study, which was to inform the decision-making process to reallocate 500 MHz of spectrum for commercial wireless broadband use. Additionally, we found that DOD's methodology substantially met the comprehensive and well-documented characteristics of reliable cost estimates, and partially met the accurate and credible characteristics.[21]

- Comprehensive—Substantially Met: We observed that DOD's estimate included complete information about systems' life cycles, an appropriate level of detail to ensure cost elements were neither omitted nor double-counted, and overarching study assumptions that applied across programs. However, some programs did not list all the discrete tasks required for relocation, and not all the individual programs had evidence of cost-influencing ground rules and assumptions.
- Well-documented—Substantially Met: We found that management reviewed and accepted the estimate, the estimate was consistent with the technical baseline data, and documentation for the majority of programs was sufficient that an analyst unfamiliar with the program could understand and replicate what was done. However, the documentation also captured varying levels of detail on source data and its reliability, as well as on calculations performed and estimation methodology used, some of which were not sufficient to support a rough-order-of-magnitude estimate.
- Accurate—Partially Met: We found that DOD properly applied appropriate inflation rates and made no apparent calculation errors. In addition, the estimated costs agreed with DOD's prior relocation cost estimate for this band conducted in 2001.[22] However, no confidence level was specifically stated in DOD's cost estimate to determine if the costs considered are the most likely costs, which is required to fully or substantially meet this characteristic.
- Credible—Partially Met: We observed that DOD cross-checked major cost elements and found them to be similar. However, some sensitivity analyses and risk assessments were only completed at the program level for some programs, and not at all at a summary level.[23] Performing risk assessments and sensitivity analyses on all projects and at the summary level is required to fully meet this characteristic, and is required on a majority of projects and at the summary level to substantially meet this characteristic.

As the Assumptions Supporting DOD's Cost Estimate for Relocating from the 1755–1850 MHz Band Change, Costs May Also Change

Even though DOD's preliminary cost estimate substantially met some of our best practices, as the assumptions supporting the estimate change over time, costs may also change. According to DOD officials, any change to key assumptions about the

[20] The rough-order-of-magnitude estimate is typically developed to support "what-if" analyses, and is helpful in examining differences in high-level variation alternatives to see which are most feasible. Because it is developed from limited data and in a short time, it should never be considered a budget-quality cost estimate.

[21] GAO's Cost Guide includes five levels of compliance with its best practices. Not Met: Provided no evidence that satisfies any of the characteristic. Minimally Met: Provided evidence that satisfies a small portion of the characteristic. Partially Met: Provided evidence that satisfies about half of the characteristic. Substantially Met: Provided evidence that satisfies a large portion of the characteristic. Fully Met: Provided complete evidence that satisfies the entire characteristic.

[22] CAPE compared the overall cost estimate using constant fiscal year 2011 dollars with DOD's 2001 cost estimate for relocating from the same band (Department of Defense, Investigation of the Feasibility of Accommodating the International Mobile Telecommunications (IMT) 2000 Within the 1755–1850 MHz Band (February 9, 2001)), adjusting for changes in the types and quantities of the systems, and demonstrated that the two estimates are within 5 percent of each other.

[23] A sensitivity analysis examines how changes to key assumptions and inputs affect the estimate. A risk assessment identifies the factors underlying an estimate that might be uncertain and the risks they pose to the estimate.

bands to which systems would move could substantially change relocation costs. Because decisions about the timeframe for relocation and the spectrum bands to which the various systems would be reassigned have not been made yet, DOD based its current estimate on the most likely assumptions, provided by NTIA, some of which have already been proven inaccurate or are still undetermined. For example:

- Relocation bands: According to DOD officials, equipment relocation costs vary depending on the relocation band's proximity to the current band. Moving to bands further away than the assumed relocation bands could increase costs; moving to closer bands could decrease costs. In addition, congestion, in both the 1755–1850 MHz band and the potential bands to which its systems might be moved, complicates relocation planning. Also, DOD officials said that many of the potential spectrum bands to which DOD's systems could be relocated would not be able to accommodate the new systems unless other actions are also taken. For example, the 2025–2110 MHz band, into which DOD assumed it could move several systems and operate them on a primary basis, is currently allocated to commercial electronic news gathering systems and other commercial systems. To accommodate military systems within this band, FCC would need to withdraw this spectrum from commercial use to allow NTIA to provide DOD primary status within this band, or FCC would have to otherwise ensure that commercial systems operate on a non-interference basis with military systems. FCC has not initiated a rulemaking procedure to begin such processes.
- Relocation start date: DOD's cost estimate assumed relocation would begin in fiscal year 2013, but no auction has been approved, so relocation efforts have not begun. According to DOD officials, new equipment and systems continue to be deployed in and designed for the current band, and older systems are retired. This changes the overall profile of systems in the band, which can change the costs of relocation. For example, a major driver of the cost increase between DOD's 2001 and 2011 relocation estimates for the 1755–1850 MHz band was the large increase in the use of unmanned aerial systems. DOD deployed these systems very little in 2001, but their numbers had increased substantially by 2011. Conversely, equipment near the end of its life cycle when the study was completed may be retired or replaced outside of relocation efforts, which could decrease relocation costs.
- Inflation: Inflation will drive up costs as more time elapses before the auction occurs.

In addition to changing assumptions, the high-level nature of a rough-order-of-magnitude estimate means that it is not as robust as a detailed, budget-quality lifecycle estimate, and its results should not be considered or used with the same confidence. DOD officials said that for a spectrum-band relocation effort, a detailed, budget-quality cost estimate would normally be done during the transition planning phase once a spectrum auction has been approved, and would be based on specific auction and relocation decisions.

NO GOVERNMENT REVENUE FORECASTS EXIST FOR A POTENTIAL AUCTION OF THE 1755–1850 MHZ BAND, AND A VARIETY OF FACTORS COULD INFLUENCE AUCTION REVENUES

Federal Agencies Have Not Produced a Revenue Forecast for the 1755–1850 MHz Band

No official government revenue forecast has been prepared by CBO, FCC, NTIA, or OMB for a potential auction of the 1755–1850 MHz band licenses, but some estimates might be prepared once there is a greater likelihood of an auction. Officials at these agencies knowledgeable about estimating revenue from the auction of spectrum licenses said that it is too early to produce meaningful forecasts for a potential auction of the 1755–1850 MHz band. Moreover, CBO only provides written estimates of potential receipts when a congressional committee reports legislation invoking FCC auctions. OMB officials said NTIA, with OMB concurrence, will transmit Federal agency relocation cost estimates to assist FCC in establishing minimum bids for an auction once it is announced.[24] OMB would also estimate receipts and relocation costs as part of the President's budget. OMB analysts would use relocation cost information from NTIA to complete OMB's estimate of receipts.

Although no official government revenue forecast exists, an economist with the Brattle Group, an economic consulting firm, published a revenue forecast in 2011 for a potential auction of the 1755–1850 MHz band that forecasted revenues of $19.4

[24] FCC calculates minimum bids for spectrum auctions typically based on bandwidth and license-area population. Bidders for specific licenses must put forth opening bids that match or exceed the minimum bid to be in contention.

billion for the band.[25] We did not evaluate the accuracy of this revenue estimate. Like all forecasts, the Brattle Group study was based on certain assumptions. The study assumed that the 1755–1850 MHz band would be generally cleared of Federal users. It also assumed the AWS–1 average nationwide price of $1.03 per MHz-pop as a baseline price for spectrum allocated to wireless broadband services,[26] and that the 1755–1780 MHz portion of the band would be paired with the 2155–2180 MHz band, which various industry stakeholders currently support. The study assumed that the 95 MHz of spectrum between 1755 and 1850 MHz would be auctioned as part of a total of 470 MHz of spectrum included in 6 auctions sequenced 18 months apart and spread over 9 years with total estimated net receipts of $64 billion. In addition, the study adjusted the price of spectrum based on the increase in the supply of spectrum over the course of the six auctions,[27] as well as for differences in the quality of the spectrum bands involved.

A Variety of Factors Could Influence Auction Revenues

Like all goods, the price of licensed spectrum, and ultimately the auction revenue, is determined by supply and demand. This fundamental economic concept helps to explain how the price of licensed spectrum could change depending on how much licensed spectrum is available now and in the future, and how much licensed spectrum is demanded by the wireless industry for broadband applications. Government agencies can influence the supply of spectrum available for licensing, whereas expectations about profitability determine demand for spectrum in the marketplace.[28]

Supply

In 2010, the President directed NTIA to work with FCC to make 500 MHz of spectrum available for use by commercial broadband services within 10 years. This represents a significant increase in the supply of spectrum available for licensing in the marketplace. As with all economic goods, the price and value of licensed spectrum are expected to fall as additional supply is introduced, all other things being equal.

Demand

The expected, potential profitability of a spectrum license influences the level of demand for it. Currently, the demand for licensed spectrum is increasing and a primary driver of this increased demand is the significant growth in commercial-wireless broadband services, including third and fourth generation technologies that are increasingly used for smart phones and tablet computers. Some of the factors that would influence the demand for licensed spectrum are:

- Clearing versus Sharing: Spectrum is more valuable, and companies will pay more to license it, if it is entirely cleared of incumbent Federal users, giving them sole use of licensed spectrum; spectrum licenses are less valuable if access must be shared. Sharing could potentially have a big impact on the price of spectrum licenses. In 2012, the President's Council of Advisors on Science and Technology advocated that sharing between Federal and commercial users become the new norm for spectrum management, especially given the high cost and lengthy time it takes to relocate Federal users.
- Certainty and Timing: Another factor that affects the value of licensed spectrum is the certainty about when it becomes available. Any increase in the probability that the spectrum would not be cleared on time would have a negative effect on the price companies are willing to pay to use it. For example, 7 years after the auction of the 1710–1755 MHz band, Federal agencies are still relocating systems. The estimated 10-year timeframe to clear Federal users from the 1755–1850 MHz band, and potential uncer-

[25] Coleman Bazelon, The Brattle Group, Inc., Expected Receipts From Proposed Spectrum Auctions (Washington, DC: July 28, 2011).

[26] The unit price of licensed spectrum is typically expressed in terms of dollars per MHz-pop, where MHz-pop is the product of total MHz of a band and population covered by the region of a license. The $1.03 price represents the current price for AWS–1 spectrum based on the original AWS–1 price adjusted for inflation using the SpecEx Spectrum Index.

[27] To adjust the price of spectrum for the increased supply, the study used the price elasticity for spectrum. According to the study, wireless broadband spectrum is generally thought to have a price elasticity of around -1.2, which implies that a 1 percent increase in the base supply of spectrum should result in a 1.2 percent decrease in its price.

[28] The value of a spectrum license, and hence the future price of licensed spectrum at a given auction, depends on many factors, ranging from the physical characteristics of the spectrum that is licensed to the general investment climate and the existence of applicable technology infrastructure. For the purposes of this discussion, we focus only on those supply and demand factors directly influenced by government decisions or wireless companies.

tainty around that timeframe, could negatively influence demand for the spectrum.

• Available Wireless Services: Innovation in the wireless broadband market is expected to continue to drive demand for wireless services. For example, demand continues to increase for smartphones and tablets as new services are introduced in the marketplace. These devices can connect to the Internet through regular cellular service using commercial spectrum, or they can use publicly available (unlicensed) spectrum via wireless fidelity (Wi-Fi) networks to access the Internet.[29] The value of the spectrum, therefore, is determined by continued strong development of and demand for wireless services and these devices, and the profits that can be realized from them.

Chairman Udall, Ranking Member Sessions, and members of the subcommittee, this concludes my prepared remarks. I am happy to respond to any questions that you or other members of the subcommittee may have at this time.

GAO CONTACTS AND STAFF ACKNOWLEDGMENTS

For questions about this statement, please contact Mark L. Goldstein, Director, Physical Infrastructure Issues, at (202) 512–2834 or goldsteinm@gao.gov. In addition, contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. Individuals who made key contributions to this statement include Mike Clements, assistant Director; Stephen Brown; Jonathan Carver; Jennifer Echard; Emile Ettedgui; Colin Fallon; Bert Japikse; Elke Kolodinski; Joshua Ormond; Jay Tallon; and Elizabeth Wood.

[29] Wi-Fi networks can permit multiple computing devices in each discrete location to share a single wired connection to the Internet, thus efficiently sharing spectrum.

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Senator UDALL. Thank you, Mr. Goldstein.

Finally, we have been joined by Mr. Christopher Guttman-McCabe, Vice President, Regulatory Affairs, CTIA-The Wireless Association. Welcome.

STATEMENT OF MR. CHRISTOPHER GUTTMAN-MCCABE, VICE PRESIDENT, REGULATORY AFFAIRS, CTIA—THE WIRELESS ASSOCIATION

Mr. GUTTMAN-MCCABE. Thank you and good afternoon, Mr. Chairman, Ranking Member Sessions, and Senator Fischer. I appreciate the opportunity to testify before you today.

CTIA represents the wireless carriers, manufacturers, and vendors that drive America's leadership in wireless broadband.

If I may, I would like to ask consent to amend my written testimony to include a letter that was submitted to NTIA this afternoon, regarding the issues that we are going to talk about on the panel today.

Senator UDALL. Without objection, it will follow your written statement.

Mr. GUTTMAN-MCCABE. Thank you.

As I noted in my written testimony, in order to maintain our world leadership in wireless broadband, the wireless ecosystem needs access to additional spectrum. Some of what is needed will come from the broadcast incentive auctions that Congress authorized last year, but as both the Federal Communications Commission (FCC), Congress, and the administration have acknowledged, closing this spectrum deficit will require reallocation of spectrum currently held by Federal users.

One frequency band that would be particularly useful to meet rapidly expanding demand is the 1755 to 1780 megahertz band, a subset of what is currently under review by NTIA. In the United States, the band is used by DOD and other Federal agencies, but internationally it is used to support commercial mobile radio services. Reallocation would harmonize U.S. and international use, produce economies of scale and scope, lower costs, speed implementation, and drive advances in our health care, energy, financial, education, and other sectors of the American economy. American consumers and businesses will get the most advanced networks and devices. The economy will benefit significantly as our industry continues to drive tremendous amounts of investment and job creation, and as we heard numerous times on the first panel, the reallocation process can help agencies to replace systems that in some cases are decades old and outdated with state-of-the-art technology.

This can be a win-win-win for the United States. We hope you can help us to move this process forward. Thank you, and I look forward to your questions.

[The prepared statement of Mr. Guttman-McCabe follows:]

PREPARED STATEMENT BY MR. CHRISTOPHER GUTTMAN-MCCABE

INTRODUCTION

Good afternoon, Chairman Udall, Ranking Member Sessions, and members of the subcommittee. My name is Christopher Guttman-McCabe and I am Vice President of Regulatory Affairs at CTIA—The Wireless Association®. CTIA represents the wireless carriers, equipment vendors, and software developers that drive America's leadership in wireless broadband. Since 1984, CTIA has helped coordinate the wireless industry's voluntary efforts to provide consumers with a variety of choices and information regarding their wireless products and services. It also supports numerous industry initiatives to educate consumers and policymakers on such issues as responsible wireless technology use, the industry's eco-friendly initiatives, and accessible wireless products and services. As Vice President of Regulatory Affairs, I work on a wide range of issues involving spectrum, regulatory mandates, and homeland security. Thank you for inviting me to testify today regarding DOD usage of the electromagnetic spectrum.

THE NEED FOR MORE SPECTRUM TO DRIVE ECONOMIC GROWTH

According to a 2012 report by Recon Analytics, the Nation's mobile communications industry is a significant economic engine, directly or indirectly supporting 3.8 million jobs, or 2.6 percent of all U.S. employment, contributing $195.5 billion to the U.S. gross domestic product and driving $33 billion in productivity improvements in 2011. As the FCC noted in its recently released 16th Wireless Competition Report, the 2010 and 2011 CTIA Wireless Indices Reports indicated that incremental capital investment by wireless operators rose to $24.9 billion in 2010, a 22 percent increase from 2009, and then increased again to $25.3 billion in 2011. In fact, in 2012, U.S. wireless carriers invested more than $30 billion—25 percent of the world's total wireless capital investment for the year. As CTIA also recently pointed out to the FCC, a Deloitte study shows that such continued capital investments -specifically in 40 wireless networks—could generate $73 billion to $151 billion in GDP growth, and create 371,000 to 771,000 jobs in America by 2016.

The industry is expected to expand as businesses and consumers increasingly rely on wireless technologies, including bandwidth-intensive smartphones, tablets, and other hand-held devices as well as machine-to-machine communications. CTIA's most recent semi-annual survey revealed that smartphone adoption and tablet use continues to grow at dramatic rates—driving Americans' use of more than 1.1 trillion megabytes of data from July 2011–June 2012, which was an increase of 104 percent over the previous year. A recent report issued by Cis.co indicated that the number of mobile-connected tablets increased 2.5-fold to 36 million in 2012, and the FCC recently recognized in its Competition Report that the adoption of smartphones alone increased at a 50 percent annual growth rate in 2011. Cisco predicts that this growth will continue, with global mobile data traffic predicted to increase 13-fold between 2012 and 2017 at a compound annual growth rate of 66 percent. As the President's Council of Economic Advisers recently reported, this explosion in wireless data usage is not only driving consumer demand for full Internet browsing, media-rich applications, and streaming video content on mobile devices, but also has the potential to facilitate significant productivity improvements in American businesses, including mobile videoconferencing, real-time remote access to inventory and sales data, and other business-to-employee and business-to-customer applications.

In order to keep pace with this growth and continue to fuel the economic engine it represents, the wireless industry needs access to more radiofrequency spectrum—the most critical input for wireless carriers. CTIA first identified a looming spectrum crisis in 2009, when it urged U.S. policymakers to "immediately launch an effort to identify and allocate significant amounts of additional spectrum for commercial wireless services" in order to meet the demands of consumers and businesses that were, and still are, increasingly dependent on "wherever, whenever" access. As FCC Chairman Genachowski more recently noted, spectrum is the "oxygen" of the wireless industry, and "if we don't free up more spectrum, we're going to run into a wall that will stifle mobile innovation, hurting consumers and slowing economic growth." While carriers have responsibly used advanced technologies to get the most out of their existing spectrum and have used unlicensed Wi-Fi spectrum to "offload"

traffic from carrier networks, those efforts are simply not enough. Carriers must have access to additional licensed spectrum in order to keep up with technological developments and consumer demand.

Unfortunately, the sources of additional spectrum are limited to existing non-government users and Federal users. On the nongovernment side, the FCC and Congress have taken aggressive measures to free up additional spectrum. For example, in last year's Middle Class Tax Relief and Job Creation Act, or the Spectrum Act, Congress authorized the FCC to conduct "incentive auctions" that may result in the conversion of some television broadcast spectrum for wireless broadband use. The FCC has already initiated a rulemaking proceeding to begin to implement that legislation.

On the Federal side, Congress has long recognized the importance of converting underused spectrum to commercial use. Twenty years ago, in the Omnibus Budget Reconciliation of 1993, or OBRA–93, Congress required the Secretary of Commerce to identify spectrum that could be used for commercial purposes. The Balanced Budget Act of 1997 also required the Secretary to identify additional spectrum. The Advanced Wireless Service (AWS) spectrum that many carriers use today was made available as a result of OBRA–93. Congress took similar action in last year's Spectrum Act, mandating that the Secretary of Commerce identify 15 megahertz of spectrum that could be converted to commercial use. The 15 megahertz in the 1695–1710 MHz band has recently been designated for such use and FCC Chairman Genachowski has said the spectrum may be auctioned as soon as September 2014. CTIA recently urged the FCC to initiate a process to convert the 2095–2110 MHz band for terrestrial wireless use and to pair it with the 1695–1710 MHz band, pointing out that the 2095–2110 MHz band is ideally suited for mobile broadband.

However, more work is necessary to make additional spectrum available. CTIA recognizes the essential role spectrum plays for government users, just as it does for commercial entities. According to a 2011 GAO study though, the Federal Government operates in approximately 70 percent of the spectrum below 3 GHz—18 percent on an exclusive basis and 52 percent on a shared basis with non-government users. Just as it is appropriate to ensure that spectrum available to the private sector is being used efficiently and for the most highly valued services, the Federal Government must evaluate the use of its spectrum and—when it can be made available for commercial operations—it should be. The President recognized the need to provide additional spectrum for broadband services and to look at Federal spectrum as part of this effort when he issued a Memorandum in June 2010 directing the National Telecommunications and Information Administration (NTIA) to review Federal spectrum use and provide a plan to make 500 megahertz available.

SHARING IS NOT THE LONG-TERM ANSWER

In order to satisfy the need for additional capacity, carriers need to be able to access spectrum on an exclusive basis. Although the wireless industry is examining whether it can share with Federal users on a limited basis and supports continued study of technologies that can facilitate greater and more dynamic spectrum sharing, shared use of spectrum is not a viable long-term solution. The technologies for such real-time, intelligence-based sharing are not available today, have not yet been proven effective, and will not yield the capacity required to satisfy the growing demand for broadband capacity. In addition, except for limited cases, shared spectrum is an inadequate resource because it is available only some of the time in particular places. Sweeping conclusions that shared use is the only future are therefore simply inappropriate. In the early 2000s, the wireless industry faced a similar "solution" to spectrum needs -ultra-wideband. Many people claimed that UWB devices could utilize spectrum more efficiently and that their commercial availability was "right around the corner." Eleven years later, CTIA is glad that policymakers focused on clearing and auctioning several bands of spectrum, driving our world-leading wireless ecosystem, while still allowing the market to go forward to investigate UWB.

Sharing can be a tool to facilitate the transition of government spectrum to commercial use, but the ultimate goal should be reallocation to the extent possible. Indeed, Congress recognized as much when it directed NTIA in the Spectrum Act to "give priority to options involving reallocation of the band for exclusive non-Federal use and [to] choose options involving shared use only when it determines . . . that relocation of a Federal entity from the band is not feasible." This preference for exclusive use has helped foster the U.S. wireless industry's deployment of mobile broadband networks and provided tremendous economic benefits for U.S. consumers and businesses. In short, sharing is one of many available tools, and as technology advances it may provide additional opportunities for maximizing efficient use of the spectrum. Today, shared spectrum can help supplement a provider's exclusive spec-

trum, but it cannot replace it, nor does it provide the incentives or certainty necessary for carriers to make the very substantial investments needed to deliver world-leading, high quality mobile broadband services to American consumers.

THE 1755–1780 MHZ BAND IS UNIQUELY SUITED FOR COMMERCIAL USE

Therefore, additional spectrum that can be used by carriers on an exclusive basis must be identified. One frequency band that would be particularly helpful in allowing wireless companies to meet rapidly expanding demand is the 1755–1780 MHz spectrum. In the United States, the band is currently used by DOD and other Federal agencies. However, the band is identified internationally for commercial mobile services and is used for that purpose throughout most of the world. Reallocation of the band would therefore harmonize U.S. allocation of spectrum with international use. The 1755–1780 MHz band is also immediately adjacent to existing domestic wireless commercial spectrum and would therefore fit seamlessly into the current mobile broadband spectrum portfolio, allowing for more immediate equipment development and deployment and facilitating easy migration of existing and developing technologies to these bands. Creating a domestic allocation that is consistent with international use will produce economies of scale and scope, making for a more robust equipment market for the band, lowering costs, and speeding implementation. International harmonization of this spectrum will also facilitate consumers' use of their wireless devices while traveling to other countries by alleviating compatibility problems.

There is broad support in the wireless industry for pairing the 1755–1780 MHz band with spectrum currently available for licensing at 2155–2180 MHz. The Spectrum Act requires the 2155–2180 MHz band to be licensed by February 2015. The 1755–1780 MHz band should be available in the same timeframe so that the two bands can be made available together. The benefits of pairing 1755–1780 MHz with 2155–2180 MHz, which will permit alignment with existing services, facilitate faster deployment of services, provide consistency with international allocation of the band, and maximize efficient use of the spectrum, are also reflected in how the spectrum is valued. A study by the Brattle Group found that auctioning the 2155–2180 MHz band by itself would yield $3.6 billion—but auctioned together with 1755–1780 MHz band, the pair would generate $12 billion. Auctioning these bands on a paired basis would therefore ensure the best economic return for taxpayers, as well as the most efficient use for broadband services.

CONGRESS HAS PROVIDED PROTECTION FOR RELOCATING FEDERAL USERS

If the 1755–1780 MHz band is reallocated for commercial operations, Federal users of the band would be completely compensated when they are relocated from the spectrum, just as they have been in past reallocation of government spectrum. For example, the wireless industry and Federal users cooperated in the relocation of operations from the 1710–1755 MHz band so that AWS spectrum could be made available. Now, thanks to the Spectrum Act, Federal users are even better protected when their spectrum is reallocated. In that Act, Congress made important changes to the Commercial Spectrum Enhancement Act (CSEA) which provides resources for government agencies to study relocation options and to update equipment to facilitate clearing or shared use of spectrum. In particular, the Spectrum Act allows NTIA to provide Federal agencies with compensation from the Spectrum Relocation Fund for "relocation or sharing costs" associated with the reallocation and auction of spectrum from Federal to non-Federal or shared use prior to auction. Those funds can be used for planning, equipment upgrades, spectrum sharing costs, and pre-auction planning costs associated with relocation or sharing. These changes to the CSEA provide the resources necessary to study and implement relocation or modernization of Federal systems.

These new protections are in addition to other existing provisions which ensure that Federal operations are not harmed as a result of a reallocation of spectrum. First, relocation costs, which now include "the acquisition of state-of-the-art replacement systems" and which are covered by the Spectrum Relocation Fund, would be funded through the proceeds of the auction ofthe band to commercial licensees. Second, the Secretaries of Defense and Commerce and the Chairman of the Joint Chiefs of Staff would have to certify that relocation spectrum identified by NTIA and the FCC "provides comparable technical characteristics to restore essential military capability," as required by the National Defense Authorization Act for Fiscal Year 2000. Finally, Federal agencies would also have the procedural protections of the CSEA, as recently amended, which requires NTIA review and approval of Federal spectrum users' relocation plans.

These protections can result in a win-win-win for the American public, Federal users and wireless carriers. As part of the process of relocating to new systems, Federal systems, many of which are decades-old and outdated, can upgrade to the newest technology—much of which requires less spectrum to perform the same functions as existing, spectrum-intensive equipment. Purchasing state-of-the-art equipment with auction proceeds will reduce ongoing maintenance and procurement costs for Federal agencies, freeing up scare resources under current budget caps. Wireless carriers can then use the relinquished spectrum to provide services and grow the economy. All Americans will benefit in three ways—by having their government use state-of-the-art secure technology to serve the public, by the growth in the economy that more wireless broadband spectrum will produce and by having wireless systems better equipped to meet increasing demand and technological change.

IMPORTANT FIRST STEPS HAVE BEEN TAKEN TO MAKE THE 1755–1780 MHZ BAND AVAILABLE

I am pleased to report that the wireless industry has already been working with NTIA to examine how the 1755–1780 MHz band can be made available for commercial use. First, the FCC has issued an experimental license for the wireless industry to test the suitability of mobile broadband services in the band. As part ofthis effort, carriers have monitored Federal operations in the band and gathered information about the uses of the band. Those monitoring efforts are now complete and the wireless industry was able to learn more about the systems that operate in the band and the spectrum environment generally in which Federal systems operate. Wireless carriers, along with NTIA, are evaluating the information they gathered in order to decide how to proceed. The next step, as far as the wireless industry is concerned, is to conduct laboratory analysis to determine when harmful interference might actually occur. While some within the Federal Government believe that only theoretical analysis is required, the success ofthis endeavor depends in part on the willingness of the wireless industry to invest billions of dollars to put this spectrum to commercial use. Our members would do so more confidently with more real-life tests.

Second, and in conjunction with monitoring in the 1755–1780 MHz band, members of the wireless industry are participating in Working Groups created under the auspices of the NTIA's Commerce Spectrum Management Advisory Committee, or CSMAC. Working Groups have been created to study each of the Federal systems operating in the 1755–1850 MHz band. These groups provide a forum for an exchange of technical information between Federal entities and industry regarding their respective systems and for discussion and exploration of potential solutions for relocation of Federal operations or for sharing.

IMPEDIMENTS TO THE USE OF THE 1755–1780 MHZ BAND REMAIN

While there has been significant discussion and cooperation between industry, DOD and other Federal entities, the current effort is insufficient to make the 1755–1780 MHz band available for commercial operations, consistent with the President's directive, in the timeframe necessary. Among other reasons, current efforts have not moved away from worst-case technical assumptions of sharing with each Federal system to a more realistic analysis and interactive dialogue about what can be done by both industry and Federal agencies to make 1755–1780 MHz available in a meaningful way while meeting the needs of Federal agencies. In light of the upcoming deadline to auction the 2155–2180 MHz band, with which the 1755–1780 MHz band would be best paired, it is critical that these issues be resolved soon.

As an initial matter, tighter processes must be established by which Federal entities are required to cooperate in evaluating spectrum availability. The Spectrum Act contains specific timeframes for Federal entities to act once spectrum is identified for auction. In that case, Congress realized that Federal entities should not unnecessarily delay the clearing of spectrum for commercial use. Unfortunately, there are no timeframes established for cooperation prior to the time that spectrum is identified. In the current evaluation of the 1755–1780 MHz band for example, it took 6 months to execute a memorandum ofunderstanding, or MOU, governing how monitoring should be conducted. Federal agencies are legitimately concerned about the dissemination of confidential information that may be produced during the spectrum evaluation process. However, that concern and the failure to develop a process that allows for productive discussion while protecting legitimately sensitive information has impeded the free flow of information and prevented evaluation or even consideration ofmeaningful solutions. Federal entities must be able to more quickly assess information that requires a high level of protection while not subjecting all information exchange to the same restrictive processes. These and other steps involved in

identifying and making spectrum available should be streamlined, as other aspects of the spectrum reallocation process already are based on Congressionally mandated timetables for action.

Second, Federal entities must engage in more realistic assessments of the impact of reallocation. As I mentioned earlier, in its recent evaluation of the exclusion zones necessary for commercial use of Federal spectrum, DOD has consistently made worst-case assumptions, resulting in a larger-than-necessary area within which commercial operations would be prohibited. While the wireless industry wishes to ensure that Federal operations receive the protection they need, it is not in the public interest for them to receive a level of protection unsupported by sound engineering practices. The worst-case analysis combined with a lack of dialogue regarding operational issues dooms any consideration of sharing options and results in wasted time and effort.

Similarly, NTIA's estimate of the economic impacts ofrelocation must be more realistic. Overstating these costs could lead to a false conclusion that the spectrum should not be reallocated, producing a missed opportunity to deliver the benefits ofbroadband to all Americans. In the experience of the wireless industry during the A WS relocation process, Federal entities often overestimated the time and costs ofrelocation. In fact, in NTIA's Fifth Annual Report on the A WS spectrum relocation process, it reported that the DOD (in particular, the Navy) returned over $51 million dollars back to the Treasury. NTIA's current estimated costs for relocating systems from the entire 1755–1850 MHz band is $18 billion, but DOD earlier estimated that it would cost only $4.6 billion to clear the entire band. There must be a more reliable review of the costs for relocating Federal users.

Finally, NTIA must begin to focus on the 1755–1780 MHz band in particular, not the broader 1755–1850 MHz band. FCC Chairman Genachowski has already announced that the FCC may auction that spectrum as early as September, 2014. However, current efforts to make that spectrum available are at an impasse because of an insistence that a complete solution be developed for the entire 1755–1850 MHz band before any decision is made with respect to the 1755–1780 MHz sub-band. The current course will fail to develop a solution in the time required to auction 1755–1780 MHz paired with 2155–2180 MHz and will result in missed auction revenue and a missed opportunity for Americans to benefit from greater access to broadband. While 1780–1850 MHz is desirable spectrum, there are no immediate plans by industry to make use of the band. In contrast, the 1755–1780 MHz band is uniquely valuable because, among other things, of the pairing opportunity with 2155–2180 MHz. The 1780–1850 MHz portion of the band has no such immediate pairing opportunity. Because 1789–1850 MHz is situated between two uplink bands—bands used for transmitting from user devices to the base station—it would also be most effectively used as additional uplink spectrum. However, it would require a corresponding downlink band—a band used for transmitting from base stations to user devices—to be useful. Because a matching downlink band is not available today, the value and use of 1780–1850 MHz is currently limited.

Additionally, in assuming that the entire 1755–1850 MHz must be relocated now, DOD has focused on the 2025–2110 MHz band as replacement spectrum. That band would be valuable as commercial downlink spectrum, like most of the 1930–2200 MHz band in which it is located. While not the same as paired spectrum, downlink spectrum can be effectively used without a corresponding uplink. It is therefore unlike the 1780–1850 MHz band, for which there is no current need, which is best used for uplink but for which there is no paired spectrum available. Accordingly, it would not be sound spectrum policy to relocate Federal systems out of the 1780–1850 MHz band now to another band like the 2025–2110 MHz band.

Rather than continue down the current course of studying reallocation of the entire 17551850 MHz band, efforts should be focused on reallocation of the 1755–1780 MHz sub-band in the near-term. Sharing or relocation studies for the 1780–1850 MHz band should continue, in aGcordance with Federal requirements and long-term technology upgrades. However, near-term action to auction the 1755–1780 MHz band paired with 2155–2180 MHz will relieve the growing pressure for spectrum, while allowing Federal agencies reliable access to 1780–1850 MHz for at least 10 years.

With a focus on 1755–1780 MHz, additional Federal assignments in that band should not be permitted. In addition, Federal agencies should be required to provide reliable estimates for clearing the 1755–1780 MHz band, not the entire 1755–1850 MHz spectrum. NTIA's Fifth Annual Report, for example, examined the entire 1755–1850 MHz band. NTIA did not provide estimates for relocation ofjust the 1755–1780 MHz band. While reallocation of the entire band may ultimately be desirable, the immediate focus should be on 1755–1780 MHz.

NTIA has consistently asserted that the 1755–1780 MHz band is difficult to reallocate because of the operations located through the entire 1755–1850 MHz band. It should, however, determine the operations that operate uniquely in the 1755–1780 MHz band in order to better assess operations that must be relocated. Systems that operate throughout the 1755–1850 MHz band can use other parts of the spectrum unless NTIA demonstrates why that is not feasible. Relocating those systems from the 1780–1850 MHz band can be part of a longer-term evaluation of spectrum reallocation.

CONCLUSION

CTIA and its members support exploration of spectrum sharing with Federal users but believe that sharing is not the long-term answer. To the contrary, in order to create certainty and to incentivize wireless carriers to make investments that will benefit the American economy and consumers, the ultimate focus should be on reallocation of spectrum to carriers on an exclusive basis. To that end, the 1755–1780 MHz band, coupled with the 2155–2180 MHz band that is already available for licensing, is ideally situated for commercial use. However, cooperation between Federal and non-Federal users is necessary to achieve the benefits that would result from commercial use of these paired bands. Congress has made important changes to Federal law in order to provide economic and procedural protections to Federal users as they are relocated. At the same time, tighter processes must be established to ensure that Federal users do not unnecessarily delay this consideration or otherwise engage in unrealistic assessments that may impede reallocation. This cooperative approach, along with an increased focus on the 1755–1780 MHz band specifically, will allow the wireless industry and Federal users to develop a plan that fully utilizes scarce resources in order to meet the mounting demand for additional wireless broadband capacity.

Thank you again for the opportunity to appear before you today. CTIA appreciates this subcommittee's continued focus on this important issue and looks forward to working with this subcommittee, Congress, NTIA, DOD, and the FCC on these issues.

[The information referred to follows:]

The Honorable Lawrence E. Strickling
Assistant Secretary, Communications and Information
The U.S. Department of Commerce
1401 Constitution Avenue, N.W.
Washington, D.C. 20230

April 24, 2013

Dear Assistant Secretary Strickling:

It has been more than eighteen months since leading Members of the House and Senate wrote to the President, stating that, for the sake of job creation, deficit reduction, and to meet our country's growing broadband needs, the Administration should prioritize re-purposing from federal use internationally-harmonized spectrum below 3 GHz in sufficiently large channel sizes.

We appreciate the steps that you have taken to implement the President's 2010 directive to make 500 MHz of federal and non-federal spectrum available for commercial mobile wireless use, including the study of the 1755-1850 MHz and other bands. We write to you now to emphasize the industry's keen interest in the 1755-1780 MHz portion of this band and the need to finalize relocation plans for this sub-band in time to be paired and auctioned with the 2155-2180 MHz band.

The leading technology around the world for commercial mobile broadband is Long Term Evolution (LTE), standards for which have been defined by the Third Generation Partnership Project (3GPP), an international standards organization. Carriers around the world have plans to deploy LTE consistent with 3GPP band plans. The 1755-1780 MHz band, when paired with the 2155-2180 MHz band, aligns closely with 3GPP Band Class 10. Pairing the 1755–1780 MHz band with the 2155–2180 MHz band would allow this spectrum to be auctioned and licensed by February 2015, as the Chairman of the Federal Communications Commission recently noted.[1]

We recognize that critical federal systems currently occupy the entire 95 MHz of the 1755-1850 MHz band. However, to meet current mobile demand, it is imperative that the government develop relocation plans for the lowest 25 MHz of the band now for an auction in the near-term. These plans should recognize the legitimate requirements of government operations, including long term access to the rest of the band at 1780-1850 MHz, if other spectrum above 3 GHz is not available for relocating those systems deployed on those frequencies.

While the 1755-1780 MHz sub-band is uniquely valuable given international alignment and the spectrum readily available for pairing at 2155-2180 MHz, the remaining 70 MHz—1780-1850 MHz—has significantly less value to the wireless industry as a standalone band. The greatest need for broadband capacity is on the downlink—the link from the base station to user devices. Because the 1780-1850 MHz frequencies are situated between the PCS and AWS

[1] *See* Letter from the Honorable Julius Genachowski, Chairman, Federal Communications Commission to the Honorable Lawrence E. Strickling, Assistant Secretary for Communications and Information, Department of Commerce, March 20, 2013.

uplink bands, it is more suitable for uplink than downlink operations. Without downlink spectrum available to pair with it, the uplink spectrum at 1780–1850 MHz is of significantly less value to industry at this time and would, with today's technology, accordingly raise significantly less in any auction.[2]

Congress has recognized that deploying internationally-harmonized spectrum benefits U.S. citizens through job growth and capital investment. Ensuring spectrum resources are available to mobile carriers will also provide additional auction proceeds to offset deficit reduction and perhaps provide needed offsets to federal agencies.

In addition, more than a year ago, NTIA's report stated that many federal systems could move off the 1755-1780 MHz sub-band within five years. Indeed, a report from the DOD in 2001 contemplated relocation from the sub-band and provided a cost estimate for such an effort.[3] A relocation cost estimate for the sub-band is needed now as well.

In sum, instead of continuing the current course of contemplating reallocating the entire 1755-1850 MHz band at some point in the distant future we strongly urge that NTIA focus the effort on reallocation of the 1755-1780 MHz sub-band as soon as possible. Sharing or relocation studies for the 1780-1850 MHz band should continue in accordance with federal requirements and should take into account the long-term evolution of available technology. However, near-term action to auction the 1755-1780 MHz band paired with 2155-2180 MHz would help relieve the growing pressure for spectrum. At the same time, federal agencies would continue to have access to 1780-1850 MHz for ten years, based on current technology and potential pairing options.

Sincerely,

Kris Rinne
Network Technologies SVP
AT&T Mobility

Chris Pearson
President
4G Americas

Neville Ray
Chief Technology Officer, T-Mobile

Nicola Palmer
Chief Technology Officer, Verizon Wireless

Steve Largent
President and CEO, CTIA
The Wireless Association

[2] The Department of Defense has proposed relocating systems in the 1755-1850 MHz band to the 2025-2110 MHz band. This would be a mistake. Because much of spectrum use in the bandwidth adjacent to 2025-2110 MHz is for commercial mobile downlink, the 2025-2110 MHz band is far more valuable for downlink than the 1780-1850 MHz band is for uplink. Congressional leaders have stated their preference for relocating federal systems off spectrum below 3 GHz. It does not make policy sense to relocate federal systems from one band below 3 GHz to another—particularly when the new proposed spectrum location could be used to meet growing demand for LTE downlink.

[3] *See The Potential for Accommodating Third Generation Mobile Systems in the 1710-1850 MHz Band: Federal Operations, Relocation Costs, and Operational Impacts,* Table 5-6, at 5-11, Department of Commerce and Department of Defense (March 2001).

Senator UDALL. Thank you for that summary.

Let me go right to General Wheeler. General Wheeler, it is my understanding that DOD, along with other agencies, resides in the block of spectrum from 1755 to 1850 megahertz. It has been proposed to transition from this spectrum as a part of the President's initiative to free up 500 megahertz for commercial use. But the estimated cost for this block is $18 billion.

How hard is it to remove some elements from the lower 25 megahertz block in that 755 to 780 megahertz band, and how does time play a role in any movements from this block?

General WHEELER. Thank you, Mr. Chairman.

I think the way to think about this is we moved out of the 1710 to the 1755 megahertz band, retuned, as was discussed before in the GAO discussion, into this new band area, the 1755 to 1850. So we have approximately 100 systems in that particular area, most of which range the whole band, not just the lower portion of the band per se. So they go from the bottom of the band to the top part of the band.

That was why the NTIA pushed for us to go ahead and take a study of the whole band and move that to another location, and also because from that particular perspective, giving a larger piece of spectrum—it is easier to do it from an auction perspective. So if you just do that lower portion, since we have to move many of the systems, even though it is just in the 25 megahertz, because they range the whole area, you do not save much cost by virtue of the whole band versus just the 25 megahertz of the band.

That part of the particular band of looking at that study of just 25 megahertz has not been completed because there is no other band for us to go to at this point that has been proposed. So the bottom line to it is we took a look at it from the whole 95 megahertz perspective and looking at going to 2025 to 2110, which is what all of our costs are based on.

Senator UDALL. Let me continue in that vein. I understand that one issue that is hindering communication between DOD and the industry is the sharing of classified information. To work through the problem, it has been proposed that we establish a trusted agent program—I think you are familiar with the concept—someone from industry with the proper clearances who can be trusted by both DOD and industry to relay information back and forth to the parties.

What is the status of the trusted agent, and do you believe having one is a useful step forward?

General WHEELER. Yes, sir. Bottom line is, yes, I think it is a useful tool to have in this. What we have out there is we have working groups that work through the specific issues associated with each of the bands. What comes out of it is a group of analysis methods and some conclusions. That is shared openly between the groups. We have American citizens and non-American citizens on these particular groups.

What industry has asked for is to go into the analysis deeper and to see exactly where all of the issues are associated with that particular analysis. So what we have done is we give the data to, normally, the NTIA and the FCC, and now we are working through the authorization to allow specific people from specific parts of the industry that are representative to have that particular data. That is presently in general counsel right now and it is going through authorization for us to do that.

Senator UDALL. So there might be more than one trusted agent. You might have some trusted agents.

General WHEELER. We are looking at 12 right now, 12 have been set forward that is going through the process right now to have those authorized to do it.

Senator UDALL. So you are implying you think that is a useful step?

General WHEELER. I think that is a useful step in that I think it builds trust. It builds transparency in there. The fact of the matter is we give them all the analysis methods today and we give them all the actual results. It is just how we go through the specific aspect of each part of the analysis. That is closed because of the classification, because it is not just a FOUO, for Official Use Only data, but it is also Secret and Top Secret data, and all of those are mixed. So that is the reason why we have to have the trusted agent aspect.

Senator UDALL. Mr. Goldstein, let me turn to you and ask you how well did DOD estimate the cost of relocating. How hard is it to factor in the time to relocate, given the complexity of many DOD systems?

Mr. GOLDSTEIN. Thank you, Mr. Chairman.

We think DOD did a pretty good job, given that this was really a feasibility study approach that they did in conjunction with other agencies and with NTIA. When we looked at our cost guides, we found that in most of the measures we looked at, they did well.

However, the biggest problem we face is uncertainty. We do not know when an auction would occur. We do not know over what period of time an auction would occur. We do not know at this point in time, as General Wheeler said, where a lot of systems would be relocated to. We do not know inflation factors. There are so many unknowns at this point in time that developing a more robust estimate which, of course, DOD would do down the line, is something that we just cannot work through at this point until we know more from the FCC and ultimately the NTIA.

Senator UDALL. Thank you for that.

Let me turn to Senator Sessions.

Senator SESSIONS. Thank you.

General Wheeler, just fundamentally how would you say DOD looks at this? Positive, negative, neutral?

General WHEELER. I would argue from the senior military side to this, they see that the strength of our Nation rides on the strength of its economy, and I believe that, sir. I think that they want to find a solution to this because they see lighting up this Nation with broadband is a positive economic piece to us. So I would argue that all the workings that I do and all the folks that I talk to in there understand that this problem needs to be from both a military continuing on with our capabilities, because we provide some very unique capabilities, but also the fact of the matter is we have to do this for the economy because it is about real jobs. So we understand that.

Senator SESSIONS. You do not doubt that it can be done without undue risk in the movement.

General WHEELER. I think if we were to move, for example, in the 1755 to 1850, just for an example, the 2025 to 2110, I think our studies show that it is doable. With the proper time and money, we can make this happen and move over to that particular spectrum. The studies that we have done have shown that that is to be true.

Senator SESSIONS. I noted, General Wheeler, the FCC informed the Department of Commerce it intends to commence auction on

the truncated 1755–1780 megahertz band as early as September 2014. Do you think that is premature?

General WHEELER. I think there are a couple of problems with it. Where are we going to go is the real question at that particular point because that is not in the FCC's transmission of their letter. There is no proposal as to, okay, for DOD, you are going to move to this particular band or go over to this part with your systems and move. So for us, it is a difficult aspect as to how do we study this and how do we take a look at it because there is a requirement for us to present a study as to how we would do that. So there is no actual direction for us to go as to what we are supposed to do in the next steps to move into another band.

Senator SESSIONS. Mr. Goldstein, as I understand it, Federal law requires the auction revenue to be at least 110 percent of the cost of relocation for an auction to take place. Is that correct?

Mr. GOLDSTEIN. Yes, Senator, it is.

Senator SESSIONS. Given the Government-wide costs to relocate, there has been an estimate as high as $18 billion?

Mr. GOLDSTEIN. $18 billion, yes, sir. That is the current estimate.

Senator SESSIONS. Is an auction of the entire band likely to reach the 110 percent requirement?

Mr. GOLDSTEIN. Once again, sir, I think it is probably premature to know. There are still so many factors out there because not only do we not know the length and time of the auction, where various systems would end up going, we do not know the price. There is only one study that I am aware of that has been done. It is several years old by an economic consulting group that basically makes assumptions that the price would be essentially the same price it was in the last auction adjusted for inflation. That may or may not be true. So there are still so many variables. It is truly hard to know.

Senator SESSIONS. Mr. Guttman-McCabe, do you have any comment?

Mr. GUTTMAN-MCCABE. I do, Senator. I think it is important maybe just to take a half step back.

So the letter that I asked for consent to enter into the record specifically asks NTIA to focus just on that lower 25 megahertz. The General is right. There really has not been a study on that 25 megahertz, and there has not been a full analysis of the $18 billion for the entirety of the band.

So what we are asking for is a focus on the 25 megahertz because of two important things. One is there is a natural pair for it that our systems can use and that pair is scheduled for auction by congressional mandate, and it has to be actually allocated and assigned by February 2015. So there are 25 megahertz that is about to be auctioned, and we are looking for the pairing for it. The natural pairing is the lower 25 megahertz that General Wheeler referenced.

What we are trying to get a sense of is what needs to happen with that 25 megahertz. Do all the systems need to be relocated? Can some of them be retuned? Can we move forward quicker with that 25 megahertz? The remaining 70 megahertz has no natural pairing to it. So the industry did not say let us look at this 95 megahertz. The industry said, I want to say maybe a half dozen years ago, let us look at the 25 megahertz.

In the interim, Congress has moved forward mandating an auction of a natural pairing for it. So what we are asking is, can we really focus on that 25 megahertz such that it can be auctioned in a way that it is valuable to the industry?

I would love to hear what General Wheeler says, but I also think we have to move a little bit quicker. It took us 6 months to execute a nondisclosure agreement with DOD. So 6 months just to put a nondisclosure agreement together so we can move forward with this analysis.

We do, we need to have a little bit of alacrity here because we have a deadline for the other half of the auction, and that spectrum, if auctioned unpaired, will bring a fraction—and I think Mr. Goldstein might agree with that—as compared to if it were paired with the spectrum that we are looking at.

So right now, you have the uplink spectrum that would be auctioned and it would be auctioned by itself, which is not beneficial to the wireless networks in the United States. So we are looking for a pairing, and that logical pairing is the bottom 25 megahertz of the entire band that the General is looking at.

Senator SESSIONS. Considering the statute, the 110 percent rule, are you concerned that that may not be reached?

Mr. GUTTMAN-MCCABE. I hate to say this because it is almost against interests, but our members seem to pay more and more every time they come to auction, right? So the last two auctions raised $33 billion combined. We have a couple of auctions coming up. We see usage—we call it a hockey stick. The usage rates are just going through the roof. When we began this process in 2009 and said there was a looming spectrum crisis, there were not tablets. There were not what we call verticals. So there was no medical usage, no smart grid, no education. The uses have changed dramatically even since we did a call to arms to say something needs to be done. So, again, I am hesitant to say it but I think it will raise a great deal of money.

I think what we need to do is find out logically what is on the other side of the equation. When we did this 10 years ago when I first started at CTIA, we did it for the advanced wireless service band. The initial DOD estimate ended up being 400 percent above what the final amount was. So what we want to do is take a good, hard look at that $18 billion, but really zero in on the 25 megahertz, what is in there, what needs to be moved or what can be retuned, what can we help to upgrade. In this environment of budget constraints, what can we take this money to legally outside of the sequestration process and outside the budget process? What can we do with this money to help some of these systems upgrade to advanced technologies? It is all incumbent on us zeroing in on that 25 megahertz.

Senator SESSIONS. Thank you. It is a complex and important matter.

Senator UDALL. Thank you very much.

Senator Fischer.

Senator FISCHER. Thank you, Mr. Chairman.

So we have a finite resource, and we have a resource that is very valuable. You said the cost or the value of it is increasing like a

hockey stick, and I see that becoming even more valuable as we see technology advancing.

Focusing on the lower 25 here, General Wheeler, in your prepared statement you said it is important to understand the long-term status of the full band as part of any decision on the lower 25 megahertz. Do you feel that the DOD can consider the lower 25 at this point without having a full plan in place, without looking at what is going to happen to the rest of it? Can you look that far into the future?

General WHEELER. I think the way I would approach it is the fact that—if I could give you an illumination of some of the systems that are in the band. We are looking at airborne platforms that go across the whole United States that actually span that whole band. We actually have satellite control functions that are in the 1755 to 1780 type area. So of those 100 systems, most come across that whole area. That is really the problem. By just going after that 25 megahertz, we really have to redo all of the systems. So where do we put those systems since we retuned out of the 1710 to 1755 and many of these receivers and transmitters no longer have the ability to do that? They are actually at the high end of their capability. So we are going to have to move them to a separate band.

We have not done a specific study, directly to your question, ma'am. So that part of it is definitely something that we can do. We are directed through the Department of Commerce or NTIA to do what we are supposed to look at, and we put all of our assets, if you will, on the movement of us from the 95 megahertz out of that particular band because the other fear we have at this particular point is we only finished moving out of the 1710 to 1755 in March, and we were told to move to the 1755 to 1850 because that was supposed to be where we were going to reside for the future. Then now it has only been a year later and we are told we are going to have to move out of that and just try to push your systems into a different area. We are trying to find a place where we can go actually reside without actually affecting the commercial aspects. We believe that is important for them as well. So we are trying to move out of the whole band.

Senator FISCHER. Did I understand you earlier when you said that this bandwidth that you are currently on now—DOD uses that in the United States, but internationally it is used commercially?

General WHEELER. In different parts of the world, it is used for different parts, but that is true.

Senator FISCHER. How does that play into the usage that DOD has? How does that work when we are overseas? How do we accommodate our system to work on this?

General WHEELER. An interesting question, ma'am, because what happens is our allies do not have enough training frequencies to come to. So they actually come to the United States to do the training with us and use our systems in many cases because we have the airspace, for example, we have the ground ranges, and we have the actual capabilities with that spectrum to train with them. So it is part of the training that we actually do with all of our allies for Afghanistan, Iraq, and all those different locations. So they come back over to our side.

From a satellite perspective, ma'am, when we control a lot of our satellites, that particular realm, they just happen in geographical areas within the United States. It is the downlinks and uplinks.

Senator FISCHER. In another part of your prepared statement, you said that the DOD is evaluating sharing part of the band with the private sector. What is the status of your evaluation of the sharing part? Then I would like to ask Mr. Guttman-McCabe how he feels about sharing.

General WHEELER. Ma'am, there are five separate working groups in that particular area. Some have already brought out their thoughts and some are completing it by the summer. We think there is some value in sharing. It is a way to make the capability for the particular bands available sooner. I would argue that probably a real solution out of this particular arena is going to be a combination of sharing while we vacate. So if you could look at it from that particular perspective, if you pair the different methodologies while you are vacating out of a specific band, you also share. The sharing can be either by time or it can be by geographic. For example, a satellite that is in space—they sometimes maintain 30 years of capability without the ability to change the frequency, but you can do geographic sharing there while you are waiting for the new system to come online.

So we agree that sharing is a methodology for the future, and to be frank, with a finite resource, I think it is going to be the only way that we will finally get to the full solution. But I also believe in the short term that using sharing while we vacate a band is the way to get that spectrum released the quickest.

Senator FISCHER. On average, how long does it take DOD to vacate?

General WHEELER. What they are saying in our studies right now, that we are looking at 10 years approximately for most systems. Now, to be frank, if you share while you are vacating in those areas, you can open up wide areas of the band within 5 years, but just not all of it, obviously, because of the satellites, et cetera.

Senator FISCHER. Thank you.

Do you want to share? Are you going to play nice?

Mr. GUTTMAN-MCCABE. It may be overly simplistic, Senator, but sharing requires two parties. DOD has been good about opening up its information and allowing us to investigate. Aside from the five groups that are working through the NTIA, we also have—three of our carriers through CTIA have what is called an STA, a Special Temporary Authority. They are investigating independently with DOD systems.

Now, the net result has to be that the asset can be used in a meaningful way, and right now what we are finding with some of the analysis is that the folks at DOD are taking a real, absolute worst-case scenario look at the analysis. I will give you an example.

Two of the aerial systems, if you overlay their exclusion zones right now, your State may be one of the few States that actually has any availability in the United States. There is some space in Maine, some in the central United States, but in the majority of the United States, both geographically and population-based, would not be usable. So sharing when the net result is that you actually

do not get access to the asset, whether it is geographic or time-based, temporal, it does not really drive any benefit.

So we are investigating sharing. We have spent a significant amount of money working with and hiring trusted third party agents, Mr. Chairman, that you talked about. We are trying to work through what it would look like ultimately. But both sides need to be willing to take fresh looks at it, to take not aggressive but real-world looks instead of worst case scenario. If we do not do that, then this notion of sharing is almost a lost cause.

Senator FISCHER. Thank you.

Thank you, Mr. Chairman.

Senator UDALL. Thank you, Senator Fischer.

I am going to begin to bring the hearing to a close. Do you have any other questions, Senator Fischer, you wanted to ask?

Senator FISCHER. Could I?

Senator UDALL. Yes, please, yes.

Senator FISCHER. Thank you very much.

I love this stuff. Thank you, guys. [Laughter.]

General Wheeler, how does DOD plan to move forward on this?

General WHEELER. Ma'am, we are continuing to work through the working groups right now. We are pushing hard.

Senator FISCHER. Working group studies. You are including the private sector, I would assume?

General WHEELER. Yes, ma'am. The working groups are part of the Commerce Spectrum Management Advisory Committee groups that is part of Commerce that we are going forward—we are being aggressive in those particular areas. We are working with those carriers that we discussed, bringing them on the various bases, and trying to get an understanding of their expertise versus ours and what we see in the different areas. We brought them across the country, allowed them on the different bases to see if there are some ideas because we think partnering with industry is the way to go.

We have used sharing a lot. If you look above that prime real estate below 3 gigahertz, 54 percent of our spectrum today is shared with Federal and non-Federal entities that we do today. 54 percent of that particular one we share this environment.

There are some systems that are difficult to share. The airborne platforms are one of them, ma'am. That is why we talk about sharing and vacating as a package because there are certain systems that do not lend themselves to easy sharing, whereas a satellite uplink where you have geographic sharing capacity does because the exclusion area is relatively small when you look at it from a geographical perspective from the Nation.

But again, from an airborne platform that rides across the whole Nation and does this, that is an issue. We have over 10,000 flights using one system per year over the United States. It is a 24/7 operation. As an aviator and as someone who flies stealth air assets, it has been one of the edges that we have used in combat. So that is a system I would argue that we would have to move out of the spectrum. The ones for satellite uplinks I would argue is geographical sharing.

So if you start to pair those and come up with that, those are real ideas to move open space and to share at the same time while you are finally going to vacate out there at a future date.

Senator FISCHER. What does the private industry see as a way forward on this?

Mr. GUTTMAN-MCCABE. I think we would agree with the General, realistic sharing with the goal of ultimately clearing. I think when you talk about competitiveness around the world, you could name the top 10 or 15 countries we would want to compare ourselves to, Japan, South Korea, United Kingdom, Italy, Germany, France, Spain, Mexico, Canada. All of these countries have brought hundreds of megahertz of cleared spectrum to market in the last year. They all get it. They are all a fraction of our size, have a fraction of our usage, and they know they want to catch up to us in terms of our leadership in the mobile space.

So for us, sharing can be an on-ramp to clearing, but to the extent that we can get the cleared spectrum that can allow us to continue to maintain the edge, we have. Military is one of them, but there are not a lot of areas in the United States that you can say we have the technological edge. We do in the mobile platform. We really do, and everything gets launched here first, and we want to maintain that. But we need real help. It cannot take 6 months to execute a nondisclosure agreement. That cannot be part of this process when we have a deadline, a clock, established by Congress to auction some of these bands.

Senator FISCHER. Thank you all very much.

Thank you, Mr. Chairman.

Senator UDALL. Thank you, Senator Fischer, for eliciting some passion and helpful responses as we face perhaps having to play King Solomon.

Mr. Guttman-McCabe, I want to give you the final question and then I will make a comment and we will bring the hearing to a close.

Talk about the trusted agent concept. I asked General Wheeler his point of view. Share your thoughts, if you will.

Mr. GUTTMAN-MCCABE. Yes. So I think we would support, we have supported it. As the General suggested, the industry gave DOD a list of 12 names that go across both carrier and manufacturer companies to try to give a broad swath of what we call our ecosystem. It makes sense.

But the entities in the trusted agent environment have to have the requisite knowledge of our systems, of our networks. Our networks move so quickly that if you—and I am going to get myself in trouble, but if you leave it to NTIA or the FCC to be the trusted agents, the reality is they do not have a clear real-time understanding of our networks. We found that with some of the working groups. We went in and said, no, this is not what long-term evolution, our newest technology—this is not the power levels. They are not the outer band of missions. They are here. It changed some of the exclusion zones by up to 80 percent. So we would love a trusted agent as long as those trusted agents have the requisite knowledge of our industry, of our ecosystem, and our networks.

Senator UDALL. I did hear General Wheeler talk about 12 such agents, and what I hear you saying is let us make sure they know in detail. I think the General agrees.

This has been very helpful. Senator Fischer and I come from a part of the country where water is a finite resource. It is the most valuable resource. The Office of Science and Technology Policy convened a group of experts who advocated that since spectrum was a finite resource much like water, we could move towards a scheme of sharing spectrum. In the west, our water law has led to the famous saying that "whiskey is for drinking, water is for fighting over." [Laughter.]

Sometimes Colorado and Nebraska team up against Kansas and sometimes Kansas and Nebraska team up against Colorado. But I would hope we could find a way to share this crucial, valuable finite resource with all the various nuances you all have shared with us.

Thank you again for attending the hearing. We look forward to further commentary and testimony you might want to submit. We will keep the record open to ask any additional questions.

This hearing is adjourned.

[Whereupon, at 4:04 p.m., the subcommittee adjourned.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 2014 AND THE FUTURE YEARS DEFENSE PROGRAM

TUESDAY, MAY 7, 2013

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

NATIONAL NUCLEAR SECURITY ADMINISTRATION MANAGEMENT OF ITS NATIONAL SECURITY LABORATORIES

The subcommittee met, pursuant to notice, at 2:34 p.m. in room SR–222, Russell Senate Office Building, Senator Mark Udall (chairman of the subcommittee) presiding.

Committee members present: Senators Udall and Fischer.

Majority staff member present: Jonathan S. Epstein, counsel.

Minority staff member present: Robert M. Soofer, professional staff member.

Staff assistant present: Lauren M. Gillis.

Committee members' assistants present: Casey Howard, assistant to Senator Udall; Lenwood Landrum, assistant to Senator Sessions; and Peter Schirtzinger, assistant to Senator Fischer.

OPENING STATEMENT OF SENATOR MARK UDALL, CHAIRMAN

Senator UDALL. The Subcommittee on Strategic Forces will come to order.

Welcome, gentlemen.

I have a short opening statement. I will turn to my colleague, Senator Fischer, and then we are very much looking forward to a round of questions and answers.

This afternoon we will receive testimony from the National Nuclear Security Administration's, or as it is also known as NNSA's, laboratories for fiscal year 2014. We will receive testimony from Dr. Charles F. McMillan, the Director of the Los Alamos National Laboratory; Dr. Paul J. Hommert, the Director of the Sandia National Laboratories; and Dr. Penrose C. Albright, the Director for the Lawrence Livermore National Laboratory.

In addition, we will receive testimony from Dr. Charles V. Shank, who is co-chairing the National Academy of Sciences study on the quality of science and engineering at the labs. Dr. Shank is

appearing in his personal capacity because the study is not yet complete.

I am interested in understanding four issues with the laboratories, and I believe this will apply to all of the witnesses. I would like to share those four issues with everybody here.

First, are the laboratories resourced properly to meet their mission over the next 5 years? The administration has gone to great lengths in a time of great budgetary uncertainty and sequestration to give the NNSA an increase of 4.1 percent. If the resources are not adequate, I would like to hear where and why.

Second, how good is the quality of science and engineering, and are we keeping the right mix of key personnel over the next 5 years for the labs to meet their mission? There will be increased requirements in the years to come to life-extend our stockpile without testing. Are we training people now and are we retaining those who we need to train to meet this challenge?

Third, are we able to meet and maintain our infrastructure needs that will allow us to respond to the upcoming challenges with our stockpile?

Dr. McMillan, specific to you, I would like your frank and honest assessment of what happened and what went wrong with the Chemistry and Metallurgy Research Replacement (CMRR) project and what is the path forward. Plutonium science is not a commercial industry, and it has been a core mission of Los Alamos since the Manhattan Project and is integral to ensuring our stockpile works as intended. Do you think that mission, particularly its science base, will weaken over the next 10 years?

In that third category, Dr. Albright, I am interested in—based on my understanding, the restructuring at the National Ignition Facility (NIF) is underway because we did not achieve sustained fusion of the target. What is your opinion of this restructuring and what do you think the consequences are of not achieving ignition to maintaining the stockpile in the future?

Fourth and finally, what do you think of the overall health of your laboratories over the next 5 years? The B61 program and related efforts are causing large hiring at Sandia, but can it be sustained with all the other efforts underway? What about the physics laboratories at Los Alamos and Livermore? B61 is not a physics program. Are you loosing key personnel and momentum? I need to hear from all of you about this.

The laboratories are great assets of our Federal Government. They have a critical national security mission of using some of our best scientific minds to maintain our stockpile to ensure we do not need to test in the future. We need to maintain the effectiveness of the laboratories to carry out this important mission now and in the future.

So, again, thank you for your attention. I very much look forward to your answers and the give and take that we will have.

Let me turn to Senator Fischer for any opening comments that she might wish to make.

STATEMENT OF SENATOR DEB FISCHER

Senator FISCHER. Thank you, Mr. Chairman.

I too would like to welcome the directors of our national laboratories and express my appreciation to all the men and women who work across the nuclear weapons enterprise. Without them, we could not maintain a strong and effective nuclear deterrent.

There is little disagreement that the nuclear weapons complex must be modernized. A November 7, 2010, White House factsheet underscored the commitment of the President to ensure the modernization of our nuclear infrastructure by increasing funding by $4.1 billion over the next 5 years—and that is for fiscal years 2012 to 2016—for the NNSA weapons activities. This included funding necessary to complete construction of uranium processing and plutonium handling facilities. Unfortunately, due to a combination of congressional funding cuts and reordered administration priorities, today we are some 34 percent, or $1.4 billion, below that stated commitment to add $4.1 billion.

According to the commander of the U.S. Strategic Command (STRATCOM), General Kehler, fiscal uncertainty remains a primary concern across the budget, and some programs have the potential to accrue additional risk in subsequent years if projected efficiencies in the nuclear weapons complex are not realized or if fiscal year 2014 appropriations are significantly less than the fiscal year 2014 budget request.

I will be anxious to hear how these funding shortfalls impact your laboratories and whether the lab directors believe they can carry out their primary missions of certifying the stockpile, extending the life of our aging nuclear weapons, and building a truly responsive nuclear infrastructure. I look forward to your testimony, gentlemen.

Thank you.

Senator UDALL. Thank you, Senator Fischer.

Let us get right to it. I think we will alternate with 8-minute rounds, I will recognize myself for the first 8-minute round.

Oh, I am sorry. I was so eager to get to the give-and-take portion, that yes, you do have an opportunity for opening statements. Please, Dr. McMillan, I will recognize you and then, in turn, we will recognize the other great scientists at the table here. Thank you.

STATEMENT OF DR. CHARLES F. MCMILLAN, DIRECTOR, LOS ALAMOS NATIONAL LABORATORY

Dr. MCMILLAN. Thank you, Chairman Udall and Senator Fischer. Thank you for the opportunity to be here today.

I am Charlie McMillan. I am the Director of Los Alamos National Laboratory. I have submitted written testimony. I would ask that that be included for the record.

Today, I will touch on opportunities to improve the nuclear security enterprise. I think that addresses some of the questions you had asked.

As I stated before this committee last year, NNSA governance will play a role in determining both our efficiency and effectiveness as we address looming mission and budget challenges coming. The recently appointed members of the congressional panel on NNSA governance bring many decades of experience and leadership. I believe the panel will deliver recommendations that will foster a

stronger relationship between the Department of Defense (DOD), NNSA, and the laboratories. In my view, governance is a piece of the puzzle, but there are other challenges as well as opportunities.

The President's 2014 budget request is encouraging. But since the 2010 Nuclear Posture Review (NPR), as you said, Senator Fischer, we are more than $1 billion from where we had expected to be when we laid out the NPR. In today's fiscal environment, we will be challenged to execute the strategies that we have laid out, and in my view, we must find new ways to deliver the capabilities the Nation needs.

The time has come to challenge conventional wisdom. This applies to big box nuclear facilities. It applies to future life extension programs (LEP), and it applies to work that our designers undertake at the laboratories. Put simply, we must implement a strategic risk assessment that balances value and cost. We must develop new approaches to sustain the stockpile in a more efficient manner.

I am proud of the way that the Los Alamos team has challenged assumptions, and with our NNSA partners, we have presented a proposal for modular facilities that we believe deliver a win-win solution that provides plutonium capabilities without a big box nuclear facility. It provides a shorter acquisition period, smaller annual costs, and simpler standardized construction. It delivers capability when we need it rather than no capability until a full big box is completed.

In the stockpile, my colleagues and I are applying similar methodologies today. Recently, subject-matter experts have been empowered to propose and evaluate some rather daring ideas to attack tough problems that have resisted conventional solutions. We can, and in my view, should do more.

Of course, stability, flexibility, and predictability will help us. These are three things that are absent in Continuing Resolutions (CR). Because we have operated under CRs for the last several years, I have very little flexibility left at the laboratory for which I have responsibility to deal with that kind of uncertainty. Should we have another full-year CR in fiscal year 2014, I am concerned that it may well have negative impacts on the laboratory.

Thank you for the opportunity to speak this morning, and I look forward to your questions.

[The prepared statement of Dr. McMillan follows:]

PREPARED STATEMENT BY DR. CHARLES F. MCMILLAN

Good afternoon Chairman Udall, Ranking Member Sessions, and the members of the subcommittee. My name is Charles McMillan and I am the Director of Los Alamos National Laboratory (LANL). I appreciate the opportunity to be here this today to discuss the challenges facing the nuclear weapons enterprise today.

Since I was last before you, Los Alamos has had to take steps, like the rest of the Federal Government, to deal with the consequences of declining budgets followed by sequestration. Although we have not yet had to furlough any of our permanent workforce this year, we are currently taking actions to constrain procurements and shrink the size of the subcontractor workforce. The sequester cuts resulted in roughly $130 million in program reductions across the Laboratory. This cut is on top of the roughly $450 million in reductions we have absorbed over the last 2 fiscal years. A little over a year ago, the Laboratory employed about 11,800 scientists, engineers, other professionals, and contractor partners. Today we are at 10,300.

As I stated before the committee last year, NNSA governance will play a key role in determining both our efficiency and effectiveness as we address looming mission

and budget challenges. The recently appointed members of the Congressional Panel on NNSA Governance bring many decades of experience and leadership in the weapons enterprise to this review. I am hopeful that the Panel will deliver recommendations that will foster a stronger relationship between NNSA, DOD, and the laboratories. I stand ready to work with the Panel should they ask for my participation. While governance will play a very important role in the future success of the enterprise, it is not the only piece in the puzzle. Future budgets and the balancing of the program will also play significant roles.

The President's 2014 budget request is encouraging. Although I am optimistic about the request, adequate funds are only the start. It is necessary that we maintain and develop the connection between the needs of the stockpile over the next decade and strategies to care for it—the people, programs, and infrastructure. I am encouraged by the consensus I believe is emerging around the Department of Defenses' (DOD) 3+2 stockpile strategy, and the plutonium strategy we have been developing at Los Alamos. Nevertheless, we are going to be challenged to execute these strategies in the constrained fiscal environment our country faces today. We're going to need to find new ways to deliver the capabilities the Nation needs.

Allow me make an analogy. You may have seen with the film "Moneyball," based on the book of the same name. When I lived in the Bay Area, the Oakland As turned baseball's conventional wisdom on its ear. They analyzed what really mattered to win. Conventional wisdom said it takes home runs and batting average to win—but the As showed that on base percentage was a more important metric for winning.

They challenged conventional wisdom to increase value, and Mr. Chairman, I submit—now would be a good time for the nuclear weapons enterprise to do the same. I believe we need to challenge existing requirements to look for flexibility in how we are currently meeting our programmatic deliverables.

I am a realist. I doubt that our budgets will increase at the rate necessary to address both our aging stockpile and infrastructure with the approaches and constraints of the past. This indicates to me that current program models may need to be fundamentally altered to both maintain the deterrent going forward, and achieve a lower cost envelope that we can afford on an annual basis.

Los Alamos has reduced its staff size by roughly 1,500 employees, we have reduced benefits, and we have developed program plans with increased risk that still meet deliverables. Mr. Chairman, Los Alamos is approaching a tipping point. I am losing my mid-career staff at an accelerating pace because they are finding better opportunities elsewhere. Our nuclear infrastructure is not being modernized, the costs associated with our LEP activities continue to rise, and our weapons designers continue to be required to focus on our aging stockpile.

Infrastructure projects such as CMRR and MOX have been delayed, weapons experiments at important science facilities like Dual Axis Radiographic Hydro-Test (DARHT) and NIF are being scaled back, and our ability to recruit and retain staff is becoming increasingly difficult. It is a trend that does not bode well for us over the long-term.

The performance and execution requirements currently mandated by our customers, while important, are in many cases driving cost escalation. Conversely, there have also been changes in requirements, initiated by the Laboratory and accepted by the government, that are creating timely options. These options can meet stockpile needs and manage the cash flow for execution. I believe that the approach we have taken at Los Alamos in providing the capabilities of CMRR—an approach that challenges assumptions and existing requirements—may have promise for other parts of the program as we move forward in a constrained fiscal environment.

If, like the Oakland As, we are to have a winning strategy with a lower budget, we will have to make fundamental changes in our basic assumptions.

As I look across the enterprise today, I see three areas of opportunity emerging as we manage the stockpile into the future:

- We should challenge the assumptions of "big-box" style nuclear facility construction.
- We must reexamine requirements driving our future Life Extension Programs—concentrating on value.
- Based on this examination, we should challenge our weapons experts to find workable solutions.

I believe we must look at these issues and decide very quickly how we are going to change the dynamic. As one of the individuals that assess the certification of the Nation's stockpile, I will tell you emphatically that it is currently safe, secure, and effective, but it is not without risk. We must craft a program that will underwrite

this statement for as long as our Nation continues to require nuclear weapons to deter potential aggressors and assure our allies.

NUCLEAR INFRASTRUCTURE MODERNIZATION

With the deferral of the CMRR-Nuclear Facility project and now the slowdown in the acquisition process for the MOX facility, plutonium capabilities appear to be on an unstable trajectory. In both cases, projected costs vastly exceed original estimates. There are many reasons why CMRR was deferred—from the incredibly long time it took to get from planning to design, to the many mission space requirement changes, and continually increasing safety and security requirements. Taken together, these have driven significant cost increases which are difficult to control and have now become common across the country in all of what I call the "big-box" nuclear facilities.

No one at Los Alamos was pleased with the decision on deferment; however, this decision created a unique opportunity for us to challenge the requirements that drove the existing design. CMRR was designed to be the classic "big box" nuclear facility—a "do it all under one roof" design. The intersection of the "3+2" strategy that has been developed by the DOD, the pits that will be required to support that strategy, and the deferred construction on CMRR has forced us to challenge the way we are doing business at Los Alamos today.

Working with our NNSA partners, we are recommending changes in requirements that are opening new options for facility acquisition. These changes should reduce cash flow profiles and extend the useful lifetime of our PF–4 plutonium pit production facility while supporting the Nation's need for pits over the coming decades.

The first change occurred when the NNSA updated the 1992 assessment of the hazards associated with plutonium. This update allows us to increase the amount of plutonium in the newly completed Radiological Laboratory Utility Office Building (RLUOB) from 6 grams to 26 grams at the same administrative hazard level. This change in requirement will allow RLUOB to play a much bigger role in our plutonium strategy than previously planned.

In the second change, NNSA has agreed to reassess requirements that could allow us to repurpose existing PF–4 lab space.

Program requirements tend to follow national priorities that are somewhat cyclical between space exploration, nuclear power and national defense. These program and priority shifts typically occur with a period of a decade or more. Since the formative period of CMRR development in 2003, a decade has elapsed and there are opportunities to re-align portions of PF–4 that were in active use by other programs circa 2003.

For example, during the Cold War, plutonium was scarce and there was a premium on recovering it rather than discarding it. As a result, almost an entire wing of the four in PF–4 is devoted to recovering as much plutonium as possible from the waste stream.

Paradoxically, in another wing of PF–4 we are converting unneeded plutonium pits into oxide so that it can be burned in reactors to produce electricity. Both are using valuable nuclear facility space. Finally, we are working with our Federal partners to develop a new modular concept for smaller plutonium facilities that can be "networked" into our existing facilities PF–4 and the RLUOB. I believe that very large construction projects that need huge annual infusions of funding to stay on schedule have become too vulnerable to delays if a budget allocation is missed. The Achilles heel of these projects is cost escalation that inevitably happens when funding shortfalls collide with precise constructions schedules.

Benefits of switching to the modular approach include:

- A shorter acquisition time
- Smaller annual cash flow profile
- Simpler construction of the second and subsequent modules through standardized design

We have typically tried to squeeze all of our mission requirements into one "big box" that builds tens of lab modules at the same time in a single complex facility project. We see the consequence: no capability until the whole facility is finished. In challenging this concept we believe that the path forward is to build one module at a time, standardize the design of the modules and acquire what we need, when we need it. We believe this approach, coupled with the changes to PF–4 and the RLUOB, can be used to meet mission needs as we move into the future.

Another concern we had when CMRR was deferred was that it pushed the potential construction period into an overlap with needed PF–4 life extension activities. I believe it would have been extremely costly to simultaneously build two facilities of that magnitude. In our proposal, we examine the possibility of reducing the

amount of the high hazard nuclear work in PF–4 by relocating it into the new modules. This reduces the risk profile in the older facility while providing lab space for less hazardous missions such as plutonium science. The process of transferring risk out of PF–4 should extend its useful lifetime and avoid a near-term, expensive replacement project. The result is a win-win situation.

I am proud of the way the Los Alamos team has demonstrated the creativity for which we are rightly known and has found ways to challenge assumptions and invent new options for the Nation. In my view, a similar approach could be applied to future Life Extension Programs.

LIFE EXTENSION PROGRAMS

The 2010 Nuclear Posture Review concluded that "The U.S. nuclear Triad of intercontinental ballistic missiles (ICBM), submarine-launched ballistic missiles (SLBM), and nuclear-capable heavy bombers will be maintained under New START." This position was based on a strategic risk assessment that:

> "After considering a wide range of possible options for the U.S. strategic nuclear posture, including some that involved eliminating a leg of the Triad, the NPR concluded that for planned reductions under New START, the United States should retain a smaller Triad of SLBMs, ICBMs, and heavy bombers. Retaining all three Triad legs will best maintain strategic stability at reasonable cost, while hedging against potential technical problems or vulnerabilities."

As I examine the nuclear weapons enterprise and assess the needs of our nuclear deterrent in the future, maintaining the Triad on the current trajectory will lead to a collision between reasonable financial resources and mission requirements.

In the past 15 years, the nuclear weapons enterprise executed three life extension projects. Today, in order to maintain the Triad, the Nation is faced with more complex and expensive life extension activities. The current B61 LEP is much more expensive than originally expected. The projected costs for the W78 intercontinental ballistic missile warhead, the W88 submarine launched ballistic missile warhead and the long-range standoff cruise missile warhead will likely follow the B61 LEP trend unless we change our approach.

Some have suggested that smaller total stockpile numbers will lead to substantial savings. On the contrary, the capabilities that the Nation needs to have a nuclear deterrent are dominated by the cost of the first weapon, and as long as that weapon is in the stockpile, those capabilities must be sustained.

Stockpile weapons range in age from 22–35 years old. Materials and testing processes of that era allowed them to be churned off the production line. Today, many of those materials are no longer available commercially or are so exotic that the specialized infrastructure that produced them has been abandoned. This has led to reclamation of some components from disassembled weapons or creation of components using new materials—processes that consume enormous amounts of time and money to ensure that these components will function as intended in the weapon.

As we execute the current W76 and B61 LEPs and look ahead to the W78 and W88 LEPs, the Nation will be challenged to execute these programs in the current fiscal environment. We must implement a strategic risk assessment that balances value against costs to sustain the stockpile in a more effective manner.

The laboratories are already applying this methodology in their conceptual designs for reuse of pits with insensitive high explosives and the development of the alternative plutonium sustainment strategy using the modular design concept. Carefully selected subject matter experts were empowered to propose and evaluate radical ideas for attacking tough problems that resist conventional solutions. A similar non-traditional approach unconstrained by the "this is the way we have always done it" mentality is needed to attack the fiscal challenges of the current life extension program.

WEAPONS DESIGNERS: LOOKING BACKWARD

Mr. Chairman, I must discuss the most important component at each of our laboratories: the people. Developing programmatic options, reframing nuclear infrastructure requirements and proposing innovative solutions all depend on the creative experts directly engaged in our stockpile stewardship activities. Today we are fortunate to have experts with the breadth to work in all of these areas; however, I am concerned about their future.

I am sometimes asked, "When will nuclear weapon science be finished?" My answer is, "Only after we no longer need a deterrent." I believe that expanding our knowledge in nuclear weapons science is the best way for the scientists and engineers to develop their own stockpile expertise. Like surgery, the technical aspects

of deterrence are learned by both study and practice. As we move further from nuclear testing, designer expertise built on direct test experience will eventually disappear. The weapons experts of tomorrow cannot simply admire the work of their predecessors. They must make their own contributions.

The nation's nuclear designers and engineers spend most of their time looking for and analyzing problems in aging systems. This is necessary and important work. As the weapons teams that have devoted their careers to preserving the past progress through their careers and ultimately retire, I am concerned that we may find ourselves short on the expertise needed to meet the deterrent challenges of the future. At some point in the future we will retire our current weapons systems. Even with the best of care, they are not immortal. If a nuclear deterrent is still required, the weapons systems will, inevitably, be different than those of the past. We must ensure that the scientists and engineers who then carry the responsibility for the deterrent have had the breadth of experience—experience gained through advancing scientific understanding and design practice rather than additional nuclear tests—to provide for the Nation's needs in a technical environment that will be substantially different than today.

I believe that the scientific and engineering talent resident at each of our laboratories offers high value to this country. Many of our weapons experts' primary responsibilities are in direct support of the stockpile. When needed, they are also the first-line experts in analyzing the weapons activities of other countries. By investing in the people, tools, and infrastructure at the labs the Nation benefits from expertise in nuclear, chemical, and biological weapons; improvised explosive devices, and space situational awareness to name a few.

CONCLUSION

In conclusion, I understand the budget situation we face. Stability, flexibility, and predictability help me manage the Laboratory. These are three things that I don't have when operating under a continuing resolution (CR). Because we have operated under CRs of various lengths over the last several years, I have nearly exhausted my flexibility in managing during these unstable periods of time. Should we have to operate in another full year CR in fiscal year 2014, I believe significant negative impacts to the Laboratory are possible going forward.

Faced with near and long-term budgetary uncertainties, I will continue to do everything in my power to meet our mission commitments within these constraints. However, I believe that challenging longstanding assumptions and reexamining what we have believed to be requirements may produce options for the stockpile that we have not yet imagined—options that may be more attractive in the current fiscal environment.

Mr. Chairman, some may ask, "Is the path we're on feasible?" I believe that it is; however, in practice, it is going to be an expensive path. The national laboratories—the national treasures that my colleagues and I have the privilege to lead—are here to provide technical options. I submit that now is the time to create paths that sustain the deterrent while challenging the ways of the past decades.

Senator UDALL. Dr. McMillan, thank you for that. Thank you for your leadership at Los Alamos.

Let us turn to Dr. Hommert who is the Director of the Sandia National Laboratories. Welcome.

STATEMENT OF DR. PAUL J. HOMMERT, DIRECTOR, SANDIA NATIONAL LABORATORIES

Dr. HOMMERT. Chairman Udall, Senator Fischer, thank you for the opportunity to testify. I have submitted written testimony that I ask be part of the record.

I am Paul Hommert, Director of Sandia National Laboratories.

I would like to begin by putting by testimony in an overall context. In my view, we are now in an unprecedented time for the U.S. nuclear deterrent, a period when for the first time the nuclear weapons enterprise must address simultaneously three important imperatives: first, sustain a smaller and increasingly older legacy stockpile for many years to come; second, modernize the Nation's nuclear deterrent consistent with policy; and third, continue to ad-

vance and utilize the tools of stewardship and ensure an infrastructure that can support these imperatives.

Sandia is engaged in all these efforts, but for us, it is the modernization challenge that is the most dynamic since these efforts revolve so much around the non-nuclear components for which we are responsible.

The most significant of these efforts is the B61 LEP. I am pleased to report that we are now nearly a year into full-scale engineering development on the B61, executing the minimum technical scope that addresses longstanding issues with the system and, when complete, will provide the Nation with the capability that will underpin the air leg of the triad for decades to come. Furthermore, I am pleased to report that we are currently on schedule and on cost.

Earlier today, I had the opportunity to show the chairman actual hardware of the joint radar module designed at Sandia and built at NNSA's Kansas City plant, which I brought today to give you a sense of how far along we are in design and development of the B61 LEP. This module replaces the vacuum tube radars in a number of our legacy B61 systems. Its advanced technology allows us to achieve a tenfold reduction in volume and greater capability. Furthermore, this module has been designed to be used in the Navy W88 alteration 370 and in the Air Force Mk21 fuze. This first-time-ever use of common technology results in a $170 million savings across these three programs.

I would like to make one last important point. To prepare our laboratory for executing these challenges, we have blended our experienced staff with early career scientists and engineers from the best universities in the country eager to work on national security challenges. With the continued support of Congress, they and their colleagues will deliver an outstanding modernized deterrent for the Nation.

I look forward to your questions. Thank you.

[The prepared statement of Dr. Hommert follows:]

PREPARED STATEMENT BY DR. PAUL J. HOMMERT

INTRODUCTION

Chairman Udall, Ranking Member Sessions, and distinguished members of the Strategic Forces Subcommittee, thank you for the opportunity to testify today on the administration's request to Congress for the fiscal year 2014 budget. I am Paul Hommert, President and Director of Sandia National Laboratories. I am pleased to join Charlie McMillan, Parney Albright, and Chuck Shank, who are here today for this discussion.

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 enterprise, Sandia is uniquely responsible for the systems engineering and integration of the nuclear weapons in the stockpile and for the design, development, qualification, sustainment, and retirement of nonnuclear components of nuclear weapons. While nuclear weapons represent Sandia's core mission, the science, technology, engineering, and business professional 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

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

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 April 18, 2012, before this subcommittee. Starting from an overall perspective of the nuclear weapons program and the challenges facing us since the end of the Cold War, I will refer to the following major topics: (1) Sandia's modernization programs with emphasis on the B61 Life Extension Program (LEP); (2) technical execution of the programs; (3) schedule, staffing, and overall cost and performance to date; (4) the scientific and technical basis for long-term surveillance and annual assessment; (5) status of the capability base needed to support our mission; (6) nonproliferation; (7) broader national security work; and (8) governance. These issues will be viewed within the context of the administration's request to Congress for the fiscal year 2014 budget and of the fiscal year 2013 continuing resolution (CR), coupled with sequestration.

MAJOR POINTS OF THIS TESTIMONY

1. The current scope for the B61 LEP is the minimum necessary to meet the threshold requirements for the B61 provided by the Department of Defense and NNSA.
2. Sandia is executing its responsibilities on the B61 LEP on schedule and on budget.
3. Based on the budgetary impacts of sequestration and current fiscal year 2014 budget guidance, we expect there will be schedule and attendant cost impacts on the modernization programs beginning in fiscal year 2014.
4. Sandia's ability to deliver with excellence on its nuclear weapons mission both now and into the future critically depends on the effective interplay between the nuclear weapons mission and our broader national security work.

PERSPECTIVE OF THE NUCLEAR WEAPONS PROGRAM

It is my view that the Nation's nuclear deterrent is now in a new era, which is characterized by three major imperatives: (1) Modernize and reshape our nuclear deterrent as national policies evolve and ensure that we have staff and infrastructure requisite to this task; (2) sustain a smaller and increasingly older legacy stockpile for many years to come; and (3) continue to advance and utilize the tools of stewardship, which are critically important to the successful execution of the first two imperatives and to mitigating the long-term risk of technology surprise.

We cannot pick and choose among these imperatives; rather, we must simultaneously make progress on all three in support of national policy. The combination of the three imperatives creates challenges in technology development and program planning and funding not experienced before by the program. Risk-based prioritization of the program is needed, along with continued emphasis on strong program management and cost-effectiveness.

Sandia has key responsibilities in the areas described by each of the three imperatives, which I will discuss in the context of the administration's fiscal year 2014 budget request. Let me begin with a discussion of the modernization activities.

MODERNIZATION ACTIVITIES

Modernizing the nuclear deterrent is guided by the strategic framework for U.S. nuclear weapons policy outlined in the 2010 Nuclear Posture Review. The challenge has been to translate that framework into an executable plan. We must have a clear understanding of and a broad agreement about the plan for our stockpile 20 years from now. That plan must be robust in the face of current and future treaty obligations, evolving policy direction, stockpile technical realities, our infrastructure capabilities, and realities of the fiscal environment. I believe such a plan has taken shape as a result of a series of decisions taken by the Nuclear Weapons Council over the past 6 to 12 months.

SANDIA'S MODERNIZATION PROGRAMS: EXECUTION, OVERALL COST AND PERFORMANCE, AND STAFFING

At present, Sandia is engaged in a broad modernization effort. The W76–1 is in full-scale production. The B61 LEP and the W88 Alteration (Alt) 370, each with a first production unit (FPU) scheduled for fiscal year 2019, are in full-scale engineering development. We are also working on the Mk21 Fuze Replacement program (also known as the W87 Fuze Replacement), which is in the late study phase and preparing to go to full-scale engineering development. The life extension for a first

interoperable warhead, the W78/88–1 LEP, is in the early study phase. These programs touch each of the three legs of the Nation's nuclear triad, and today we are successfully executing against the plans and integrated master schedules for the programs.

The B61 LEP

The B61 LEP is essential to meeting the U.S. Strategic Command's requirements and the extended deterrence objectives of the 2010 Nuclear Posture Review. The current scope of this life extension maximizes the reuse of nuclear and nonnuclear components while still meeting military requirements for service life extension and consolidation of multiple versions of the B61 into the B61–12, which is the name for the version of the weapon after modernization. The scope of the B61 LEP is fundamentally related to issues that have been documented in annual assessment letters by Sandia National Laboratories directors for a number of years. That a number of age-related aspects have been identified in surveillance of various B61 modifications (or Mods) is not surprising, given that some components in the B61 family are now older than 40 years. But there are also other factors, such as future lifetime, compatibility with delivery platforms, Mod consolidation, and technology obsolescence, all of which serve to define in detail the technical scope that must be executed for the life extension program. It is my strongly held view that the current scope for the B61 LEP is the minimum necessary to meet the threshold requirements for the B61 provided by the Department of Defense and NNSA.

It is this scope that the Nuclear Weapons Council endorsed in December 2011 as the recommendation for the B61 LEP with an FPU in 2019. It should be noted that this threshold scope resulted in a 40 percent reduction in the B61 LEP costs at Sandia over those associated with an earlier "full scope" LEP. Only one definitive cost estimate has been generated for the current scope of the B61 LEP, and the associated data were integrated across the nuclear security enterprise to derive a single, Complex-wide estimate. The lower costs were achieved by narrowing the technical scope of the program through the judicious reuse of certain components, coupled with robust top-down cost management principles that resulted in a reduced number of development builds and qualification testing. The overall cost of the B61 LEP includes approximately $3 billion for Sandia over a 12-year period. While the cost of the Complex-wide B61 modernization program is significant, over the next decade it represents less than 10 percent of NNSA's nuclear weapons budget. When complete, this life extension will provide the Department of Defense with a consolidated B61 representing a major element of one leg of the nuclear triad that will have reduced surveillance and maintenance costs and a lifetime to span decades to come. However, we recognize that all the work we do is occurring in a time of significant national budget challenge. Thus, we must ensure our utmost effort to deliver these programs on cost and schedule. To this end, we have stood up an organization to manage schedule and risks, staffed with professionals who have successfully managed large programs at Sandia involving high standards of rigor. The B61 LEP is currently within budget and on schedule with respect to the critical path.

To date, we have not missed a single milestone in the program. Thus, we have successfully completed all the component gate reviews (or programmatic reviews) and all the component conceptual design reviews (or technical reviews). We delivered required parts for mechanical environments testing, and the first test body has been assembled and is being tested; we begin initial system-level electrical compatibility testing this year; and we are actively engaged with Boeing on tail kit assembly integration.

I have brought with me today actual hardware of the joint radar module designed at Sandia and built by NNSA's Kansas City Plant as it will give you a sense of how far along we are in the design and development of this life extension. Interestingly, this module replaces the vacuum tube radars in a number of our legacy B61 radars. Through the use of advanced technology, this radar achieves a tenfold reduction in volume, greater capability, and resistance to countermeasures. As an example of one of the numerous components for the B61 LEP that are moving toward final design maturity, this particular component also illustrates our joint radar module concept. Similar hardware will undergo flight testing at the Tonopah Test Range for the B61 LEP and will be flown on a Navy Submarine Launched Ballistic Missile test for the W88 Alt 370 program to support our design and qualification process.

Designing and utilizing this joint module for the B61 LEP, W88 Alt 370, and Mk21 Fuze Replacement programs are estimated to save approximately $170 million over three separate development efforts. More detail on the joint radar module concept will be provided in the next section.

While we are off to a strong start on the B61 LEP, fiscal years 2014, 2015, and 2016 are crucial for maintaining the cost, schedule, and performance of the overall

program. In this regard, we are pleased to see the strong support for the program in the fiscal year 2014 budget request to Congress. However, as a result of sequestration impacts in fiscal year 2013 and fiscal year 2014 budget guidance below baseline funding requirements, it is my view that, unless this situation is reversed, schedule will likely be affected. I want to emphasize that our baseline requirements have remained essentially unchanged since June 2012. We continue to work with NNSA to close this gap while simultaneously working to minimize schedule impacts. Reductions from the baseline funding requirements are, in my view, the most significant risk to maintaining schedule and therefore the overall program cost.

Further Modernization Efforts

The B61 LEP is one in a series of programs that have been documented in the fiscal year 2012 Stockpile Stewardship and Management Plan. Among them are the W88 Alt 370 and a W78/88–1 LEP. Sandia is also engaged in the Mk21 Fuze Replacement program, which is entirely funded by the U.S. Air Force.

Our successful record of using common technologies and components across multiple systems that have been deployed in the U.S. stockpile has helped reduce development risk and manage development costs. We are extending this approach to development of the Arming, Fuzing, and Firing (AF&F) system. Today, a modular AF&F design is being developed for the W88 Alt 370, the Mk21 Fuze Replacement, and potentially for the W78/88–1 LEP. By capitalizing on work we have done over the past decade on modular warhead architectures and adaptable nonnuclear components, Sandia is supporting the Nuclear Weapons Council's plan for stockpile modernization cost-efficiently and with reduced risk. Although not directly interchangeable to accommodate missile interface differences, the underlying technologies and components are eminently adaptable to each of these warhead applications and thus result in cost savings and reduced risk. In addition to the ballistic missile warhead applications, these same technologies and, in some cases, nearly identical components are being used in the B61 LEP. As in the past, rigorous performance testing in qualification, production, and surveillance mitigates the common-mode failure risks attendant to this approach. In addition, the silicon fabrication complex at Sandia and the Kansas City Responsive Infrastructure Manufacturing and Sourcing (known as KCRIMS) facility provide the Nation with a secure, responsive infrastructure for addressing production or design issues if they arise.

W88 Alt 370

Sandia is currently executing the W88 Alt 370, which involves replacing the Arming, Fuzing, and Firing (AF&F) system. The fiscal year 2019 FPU schedule for the W88 Alt 370 is driven by the overall Navy program and schedule, components reaching their end of life, and the need for additional surveillance quantities. This program is aligned with the Mk21 Fuze Replacement program. In order to determine any schedule impacts, we are currently assessing jointly with the NNSA and the Navy the post-sequestration fiscal year 2013 funding, the fiscal year 2014 budget request, and the out-year outlook.

Mk21 Fuze Replacement

The W87 Arming and Fuzing Assembly, an Air Force subsystem, requires replacement with a first production unit in fiscal year 2019. Alignment of this program with the B61 LEP and W88 Alt 370 allows the Air Force to receive approximately $85 million in savings as a result of using the common radar module, the hardware I have shown you today. This program is funded entirely by the Air Force. Funding shortfalls in fiscal year 2013 are being worked directly with the Air Force. The Mk21 Fuze Replacement and the W88 Alt 370 programs are highly interdependent: A slip to one program will affect schedule and cost for the other.

Preparing the Laboratory to execute the B61 LEP, W88 Alt 370, and Mk21 Fuze Replacement modernization efforts has been a major focus of our leadership over the past several years. Our efforts have included collocation of the core design teams, enhancements to our classified networks reflective of the volume of work, and most significantly, staffing and training of the workforce. The staffing requirement for these modernization efforts exceeds 1,000 people. I am pleased to report that, despite numerous periods of budget uncertainty over the past 18 months, we have been extremely successful at staffing the program against a very aggressive staffing plan. Two staffing approaches have allowed us to achieve the required staffing levels for the modernization programs: (1) internal staff movements from other Sandia programs that require skills synergistic with those for the nuclear weapons program and (2) external hiring. Since 2010, we have hired some 500 advanced-degree scientists and engineers. The overall members of the workforce at the Laboratory remained essentially flat through this period. Of those we hired new to Sandia, approximately 58 percent are early in their professional careers. The modernization

program provides opportunities for these 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. It is very important that we provide individuals such as these with an environment where they can undertake the multiyear learning it takes to technically steward the Nation's nuclear stockpile now and into the future, after the modernized warheads are in the stockpile. We have a new and strong contingent of scientists and engineers prepared to take on that challenge, and we must strive to provide the stability, focus, and national commitment that will enable their success.

At the end of this decade, upon completion of the B61 LEP, W88 Alt 370, Mk21 Fuze Replacement, and W76–1 production, the Nation will have modernized at least one element of each leg of the triad.

W78/88–1 LEP

Last year, I testified that the results of the W78 LEP Phase 6.1 concept assessment study were planned for briefing to the Nuclear Weapons Council Standing and Safety Committee later in the year. I am pleased to report that the study was well received and a Phase 6.2 was authorized by the Nuclear Weapons Council in June 2012 for an interoperable warhead feasibility study, called the W78/88–1 LEP, supporting both the Air Force ICBM and Navy SLBM systems. The work we are currently doing on the previously discussed modernization efforts will position Sandia to effectively support the W78/88–1 LEP study.

SUSTAINING THE CURRENT STOCKPILE

Sandia, together with the other two NNSA national security laboratories, has key responsibilities in ensuring the safety, security, and effectiveness of the Nation's nuclear deterrent. The stockpile surveillance and assessment program plays a crucial role in establishing that required confidence in our nuclear deterrent. It is through stockpile surveillance that nuclear weapons are taken apart to test the components. Test results provide the necessary data to help us assess the safety, security, and reliability of the stockpile.

Stockpile Surveillance and Assessment

Findings from conducting this program provide the technical basis for our annual stockpile assessment reported to the President of the United States and inform decisions about required elements of the life extension programs and their timelines.

Multiple drivers heighten the importance of the surveillance program. Among them are the following: an unprecedented age of the stockpile, which includes many subsystems that were not originally designed for extended life; smaller stockpile numbers, which heighten the importance of individual warhead reliability; scoping decisions for stockpile life extensions; and for at least the next 20 years, surveillance of a stockpile that will contain simultaneously both our oldest weapons and life-extended weapons. The latter group must be examined for possible birth defects and for further aging of reused components.

Although fiscal year 2012 surveillance funding at Sandia was seen as a positive indicator, the fiscal year 2013 funding allocation after sequestration impacts has required that we constrain surveillance efforts; initial indications are that the fiscal year 2014 proposed funding for Sandia will be, at best, flat compared with fiscal year 2013 levels. Despite funding constraints, Sandia is committed to fully support the flight test program with the Department of Defense. However, we cannot provide annual laboratory testing, as historically we have done, for each system in the stockpile. The testing period will have to be stretched out. At the same time, our efforts to implement the component testing and new diagnostics and models fall further behind. These capabilities provide understanding of margins, uncertainties, and trends needed to (1) ensure the stockpile is safe, secure, and effective, (2) understand the lead times necessary to respond to aging issues that would have the potential to reduce stockpile safety, security, or reliability, and (3) support decisions on scoping for stockpile life extensions. Furthermore, several of our key surveillance facilities located in New Mexico, California, Texas, and Nevada are being operated with minimal investments in spare parts and preventative maintenance; as such, we are at risk for extended test outages due to equipment failures. To minimize the risk to the stockpile, given the realities of the current fiscal environment, we continue to apply a risk-based prioritization of our surveillance activities. A reduction in the number of systems requiring surveillance can also mitigate the pressure on the surveillance budget. Successfully completing the current modernization efforts should enable decisions regarding any reductions in stockpile types or numbers.

ADVANCING THE TOOLS OF STEWARDSHIP

During the stewardship era, the quintessential challenge was the elimination of underground testing. The sustained support received for stewardship has allowed us to make enormous progress in our understanding of nuclear weapons function in the absence of underground testing and has enabled us to attract talented staff. We must continue to advance and apply the tools of stewardship during today's modernization era.

Science-Based 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.

I am pleased that the fiscal year 2014 budget request continues to address the recapitalization program for our silicon fabrication facility, the requirements for which I have addressed in prior testimony. Funding in fiscal year 2013 enabled us to replace the single most-expensive and highest-risk item in the facility. The fiscal year 2014 budget request continues the recapitalization program at the planned level, but I would note that for program completion, commitment to multiyear funding is required.

I will restate that Sandia stewards for the nuclear weapons program, as well as for the DOE's nonproliferation payloads, the microelectronics research and fabrication facility, where we design and fabricate an array of unique microelectronics, specialty optical components, and microelectromechanical system devices. Recapitalization will reduce the risk for delivering the B61 LEP and ensure production of the radiation-hardened components required by the W88 Alt 370 and all future reentry system life extension programs. As we go forward on modernization, our microelectronics fabrication facilities, which form the basis of our trusted foundry, will be critical to ensuring the integrity of our supply chain.

In addition to the silicon fabrication facility, we have significant recapitalization needs at various experimental and test facilities critical to B61 LEP, W88 Alt 370, and future LEP success, particularly at the Tonopah Test Range. The fiscal year 2014 budget request supports our ability to reduce risk to the modernization program through investments in those capabilities as well.

In addition to these fabrication, 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 continue to prove to be indispensable to our broader national security work.

I am very pleased to report that fiscal year 2013 funding enables us to finish renovating our suite of mechanical environment test facilities, which are essential to supporting the design and qualification of the B61 and other life extensions.

I want to emphasize that the investments in our stewardship tools over the past 15 years enable cost reductions in our modernization efforts through increased use of computational simulation, which reduces the amount of qualification testing; allows, for the first time, confident qualification of some components without either nuclear testing or expensive aboveground facilities; and affords important insights into the challenge of predictive aging for our older stockpile.

Technology Surprise

Continued scientific and technological advances around the world remind us that the Nation must be aware of those advances in order to prevent a technological surprise. One example is the area of high energy density physics and inertial confinement fusion, which is experiencing rapid advances and growing worldwide interest. While achieving inertial confinement fusion ignition is a tremendous technical challenge, we must continue to pursue a national effort to achieve ignition for its importance to our long-term understanding of the stockpile and confidence in our deterrent position. At Sandia National Laboratories, we utilize the Z pulsed-power facility, the world's most-energetic high energy density physics driver, to study high energy density physics and inertial confinement fusion for the stockpile stewardship program. I believe that a robust research program on the Z facility is essential to the Nation for it provides risk mitigation for achieving inertial confinement fusion consistent with the recent NNSA "Path Forward" document; is complementary to the activities at the National Ignition Facility and Omega laser at the University of Rochester; and is important to preventing technological surprise. Beyond the considerations of ignition, I believe it is important for all three laboratories to conduct limited exploratory studies on weapon concepts to ensure that staff stay current in this area and that significant asymmetries cannot impact the position of our deterrent.

SYNERGY BETWEEN OUR NUCLEAR WEAPONS MISSION AND BROADER NATIONAL SECURITY WORK

Today's national security challenges are complex and highly diverse. The NNSA laboratories are contributing solutions to those challenges. To energize and sharpen its nuclear weapons competencies, Sandia relies on its broader national security work. The symbiotic relationship between the nuclear weapons mission and broader national security missions prevents insularity and creates a challenging, vigorous scientific and engineering environment that has helped us attract and retain the new talent we need. Such an environment is essential to succeed against the challenges we now face. Let me give you two examples that highlight the way in which this symbiotic relationship works at Sandia.

First, I will give a technology example. Sandia has led the development of real-time processing and high performance-to-volume ratio technologies for synthetic aperture radar (SAR). Both technologies were made possible by our extensive radar design and development work for nuclear weapon fuzing. The technologies have been leveraged and are 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 radio-frequency integrated circuits. We are now applying these modern technologies to the design of the replacement radar for the B61 LEP, the W88 Alt 370, and the Mk21 Fuze Replacement with a high degree of commonality, which leads to cost savings.

My second example is Sandia's satellite program, which spans about five decades and has grown steadily with numerous customers. This program, which provides our Nation with critical national security capabilities, has brought with it a very rigorous program-management environment for moving advanced technology within tight schedule requirements. We have leveraged the knowledge accumulated in these areas to our nuclear weapons program.

I strongly believe that today it is not possible that my Laboratory could deliver consistently on the commitments to the nuclear weapons program without the synergistic interagency work that attracts top talent, hones our skills, and provides stability through the cycles of the nuclear weapons program.

Government commitment to the broad national security work of the laboratories is essential for the United States to ensure the preeminence of our nuclear weapons and to enable multidisciplinary technical solutions to other complex and high-risk national security challenges. In no way does our interagency work detract from our focus to execute our core nuclear weapons mission.

Nonproliferation

U.S. policy articulated in the 2010 National Security Strategy and reflected in recent events in the United States and around the world demonstrates the growing complexity of today's threat environment arising from weapons of mass destruction (WMDs). Sandia has a broad portfolio of nonproliferation activities containing a full array of programs aimed at combating the proliferation of WMDs. Working collaboratively with Los Alamos and Lawrence Livermore national laboratories and several other DOE laboratories, we are:

- developing technologies to "convert, remove, and protect" nuclear and radiological materials that could be used in nuclear and radiological weapons,
- conducting international work for material protection,
- increasing effectiveness in large-scale field experimentation for nonproliferation test monitoring and arms control,
- ensuring that the on-orbit satellite program meets current requirements and adapts to future monitoring challenges,
- developing ground-based systems for more effective seismic monitoring,
- enabling other countries to develop nuclear security centers of excellence,
- enhancing the safety and security of biological and chemical laboratories and facilities around the world to reduce the risk that terrorists can acquire biological or chemical capabilities, and
- conducting international work in support of cooperative threat reduction programs.

In addition to working with other laboratories, we are engaging globally with international partners in more than 100 countries to reduce the threat of proliferation.

Our primary customers for this work are the NNSA, Department of State, and Department of Defense. We know that Congress will continue to support our customers' programs aimed at assessing the risks from WMD, evaluating technologies, and implementing safety and security programs that will protect us from the extreme dangers presented by nuclear, biological, and chemical threats.

With respect to the fiscal year 2014 Budget request to Congress, I will make three points: (1) We strongly recommend that the U.S. Nuclear Detonation Detection System be funded as proposed in the fiscal year 2014 budget request to Congress. The fiscal year 2013 CR, coupled with sequestration, severely hampered the ability of Sandia and Los Alamos national laboratories to deliver the satellite payloads. Indeed, for the first time in decades, future payload deliveries are in jeopardy. Without the increase proposed in the fiscal year 2014 budget request, the Nation runs the risk of damaging its capability for important nonproliferation programs. (2) It is important to support technologies that develop transparent and verifiable capabilities for future treaties. (3) Considering the significance and increasing complexity of worldwide nuclear material developments, it is important to ensure funding for programs focused on securing nuclear materials, such as the Global Threat Reduction Initiative, and programs that support international cooperation on related aspects of science and technology.

GOVERNANCE

At the time of my testimony last year, the National Academy of Sciences had recently released its report of national laboratory governance by the NNSA. That report and a subsequent study by the National Academy of Public Administration indicated that there were areas where improvements in the governance and oversight of the laboratories are possible and recommended. The National Defense Authorization Act for Fiscal Year 2013, recently signed into law, called for the creation of a Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise to study this area and make recommendations to Congress. From my perspective, all these examinations are warranted as I believe the effectiveness of the somewhat unique government-owned/contractor-operated model employed by the DOE and NNSA to manage the laboratories as FFRDCs has eroded under the current DOE–NNSA governance arrangement. We look forward to engaging with the Congressional Advisory Panel on this topic. Based on its exceptional members and expansive charter, I am confident that the panel will bring the careful, comprehensive examination needed by this complex but very important topic.

CONCLUSIONS

The new era of our Nation's nuclear deterrent is characterized by three major imperatives: modernizing the nuclear deterrent, sustaining a smaller and increasingly older stockpile, and continuing to advance the tools of stewardship. It is important that the nuclear weapons enterprise be engaged in these three imperatives simultaneously, maintaining a balance across them.

Sandia is conducting work in all three areas referenced above, and it is responsible for a large portion of the modernization activities. To that end, we have been extremely successful at staffing the modernization programs against an aggressive staffing plan. We are currently executing the programs. We are committed. We are confident that our in-depth scientific, engineering, and technical expertise will enable successful completion of the programs.

We are off to a strong start on the modernization programs, particularly the B61 LEP. In this regard, we are pleased to see the strong support for the programs in the fiscal year 2014 budget request to Congress. I want to emphasize that the current technical scope for the B61 LEP is the minimum scope necessary to meet the U.S. Strategic Command's requirements and the extended deterrence objectives of the 2010 Nuclear Posture Review. We are actively working with the NNSA to ensure that funding requirements are met in order to maintain schedule and cost performance on these vital modernization programs.

I will restate that Sandia's ability to deliver with excellence on its nuclear weapons mission both now and into the future critically depends on the effective interplay between the nuclear weapons mission and our broader national security work. Sandia is committed to fulfilling its service to the Nation with excellence and judicious cost management. 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 sound path forward for U.S. nuclear deterrence.

Senator UDALL. Thank you, Dr. Hommert.

Dr. Albright, from the Lawrence Livermore National Laboratory, welcome.

STATEMENT OF DR. PENROSE C. ALBRIGHT, DIRECTOR, LAWRENCE LIVERMORE NATIONAL LABORATORY

Dr. ALBRIGHT. Chairman Udall and Senator Fischer, I am Parney Albright, the Director of Lawrence Livermore National Laboratory. I have submitted written remarks for the record, I ask they be included in the record.

Thank you for the opportunity to provide my perspective on the President's fiscal year 2014 budget request and its impact on the stockpile stewardship program. In the interest of time, I will just emphasize three main points in my oral remarks.

First, balanced investment is crucial to the stockpile stewardship program. The 2010 NPR recognized that two types of investments are essential for effective deterrence. First, we must modernize the stockpile. LEP-related activities at Livermore include work on the W78/88–1 LEP and also concept development for the long-range stand-off cruise missile. Timely execution of the planned LEPs is important.

But LEPs are not our only job. As both of you pointed out in your opening remarks, effective long-term deterrence also requires the laboratories sustain the capabilities, knowledge, and skills underpinning the science, technology, and engineering base.

An important component of the strategic hedge against technical surprise and changes in the national security environment that underpins our ability to do reductions in the stockpile is a healthy complex both in terms of workforce and capabilities. At Livermore, we have important theoretical and experimental capabilities such as the Sequoia supercomputer and the NIF that allow us to assess and certify aging weapons, conduct significant finding investigations, develop options for LEPs, innovate when needed, and provide that strategic hedge.

Second, the fiscal year 2014 budget request undermines the execution of some key stewardship activities. I am particularly concerned about the impact of the budget request and operations at the NIF, a uniquely important stewardship facility because of its unmatched capabilities to provide data that is relevant to the nuclear performance of weapons. The request cuts $80 million from the unsequestered fiscal year 2013 operating budget for NIF, a nearly 25 percent reduction that comes on top of a $30 million cut in the prior year. This will significantly limit our ability to utilize the NIF and undermine the stewardship program.

Third, Livermore is ready and eager to improve the governance of the nuclear weapons enterprise, and we look forward to working with our partners in the Government in that regard.

I applaud this committee for helping to establish the commission to examine governance of the nuclear complex. I want to make a few observations about this, and I have more in my written remarks.

First, there should be a single voice that sets policy associated with the laboratories, and that voice should be close to the mission in order to weigh the impact of policy decisions on the delivery on

the mission of the complex. Most specific implementation practices should be left to the federally-funded research and development centers (FFRDC), the laboratories. We are partners executing a shared national security mission together. Governance should reflect that partnership. Because we are partners with the Government, I am an advocate for getting the capabilities needed into the Government that are essential for establishing credibility with the various stakeholders, both in Congress, DOD, and elsewhere.

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

[The prepared statement of Dr. Albright follows:]

PREPARED STATEMENT BY DR. PENROSE C. ALBRIGHT

OPENING REMARKS

Mr. Chairman and members of the subcommittee, I am Parney Albright, Director of the Lawrence Livermore National Laboratory (LLNL). I thank you for the opportunity to provide my perspective on the President's fiscal year 2014 budget request and its impact on the important Stockpile Stewardship Program activities carried out at LLNL and our efforts to sustain over the long term a healthy, vibrant Laboratory, advancing and applying science and technology to meet the country's most important national security needs.

As one of the Department of Energy's (DOE) National Nuclear Security Administration (NNSA) national security laboratories, we are responsible for helping sustain the safety, security, and effectiveness of our Nation's strategic deterrent. In addition to our stockpile stewardship efforts, we leverage our capabilities to develop innovative solutions to major 21st century challenges in nuclear security, defense and international security, and energy and environmental security. I thank the committee for your continuing support for the important work we do.

INVESTMENTS IN STOCKPILE STEWARDSHIP AND ACCOMPLISHMENTS

Beneficial Increased Attention

The Stockpile Stewardship Program (SSP) has benefited from the attention given to it by Congress and the administration since the 2010 Nuclear Posture Review (NPR). The review reemphasized the need to "sustain a safe, secure, and effective nuclear arsenal as long as nuclear weapons exist." It also recognized that "significantly increased investments" were required to modernize an aging stockpile and to sustain the capabilities, knowledge, and skills in the underpinning science, technology, and engineering base. Both types of investments are essential for effective deterrence, especially as the Nation strives for further worldwide reductions in nuclear arms. As noted in the NPR, a key enabler to stockpile reductions (such as those associated with New START) is a healthy nuclear weapons complex. A complex with sustained nuclear-weapon design and production capability is a key component of our Nation's deterrent and serves as a strategic hedge against technological surprise and a changing national security environment.

Considerable progress has been made in developing a strategic vision for the stockpile, and we are beginning to implement it. NNSA and the Department of Defense (DOD) are undertaking a needed set of life-extension programs (LEPs) to modernize the aging stockpile, with consideration being given to enhanced safety and security and interoperability among delivery systems in order to reduce the overall size of the stockpile. LEP-related activities at LLNL serve extremely important multiple benefits of exercising critical skills in program management, weapons design and development, and weapons engineering that the Laboratory must sustain and pass on to future generations of stockpile stewards.

We also are enhancing computational and experimental capabilities to assess and certify aging weapons, conduct significant finding investigations, and develop options for LEPs. These tools are also vital for training and honing the skills of current and future generations of stockpile stewards. I will highlight accomplishments at LLNL, including our work on the W78/88–1 LEP and concept development for the Long Range Standoff weapon. In addition, Livermore has brought two powerful tools—the Sequoia supercomputer and the National Ignition Facility (NIF)—into full operation and describe their application to the SSP.

Budget Challenges

Sustaining progress on SSP priorities through a balanced set of investments is especially challenging at a time of budget austerity. Because weapons in the stockpile continue to age beyond their intended service life, timely execution of planned LEPs is vitally important, with the objective of implementing over time the Nuclear Weapons Council's "3+2" strategy for the future stockpile. Concurrently, we need to invest in the infrastructure of the NNSA enterprise—production capabilities and the people and tools that provide the science, technology, and engineering underpinning of stockpile stewardship.

Work on LEPs is job #1 for NNSA, although funding constraints are pushing out completion of planned LEPs about as far as is acceptable. However, LEPs are not the only job. As noted earlier, a healthy complex is a crucial component of the Nation's strategic hedge against technological surprise or changing world conditions. Some things are going well. Plans for the Uranium Processing Facility (UPF) at Y–12 are moving forward. We are also fully supportive of the revised plans to provide modernized plutonium research and pit production capabilities at Los Alamos National Laboratory (LANL) and make use of the Superblock facilities at LLNL. However, a consequence of these important investments is highly constrained funding for the all-important science and technology base of stockpile stewardship. That is a source of considerable concern to me because of its immediate impacts on our laboratory in particular in fiscal year 2014 and because of the long-term effects on the health of stockpile stewardship.

Stockpile Stewardship Accomplishments at LLNL

SSP efforts at LLNL in fiscal year 2012 and early fiscal year 2013 have resulted in numerous key accomplishments supporting the SSP. Highlights include:

- Annual Assessment. We completed Cycle 17 of the annual assessment process and the second cycle of the Independent Nuclear Weapon Assessment Process (INWAP), in which LLNL applies its unique approach to nuclear weapons assessment to the systems for which LANL has primary responsibility, and vice versa. These assessment activities greatly benefited in quality and increased scientific rigor due to improvements in weapon physics simulations.
- The W78/88–1 LEP and concept development for the long-range standoff (LRSO) weapon. NNSA and DOD launched the Phase 6.2/6.2A activity on the W78/88–1 LEP in fiscal year 2012. The considerable progress to date is supporting an early down-select of a preferred option for the LEP. LLNL weapons experts are evaluating options to incorporate enhanced safety and security features. Options for interoperability of the nuclear explosives package with the U.S. Navy's W88 warhead are also to be considered as part of the study. In support of an Air Force-led LRSO study, Livermore developed a spectrum of nuclear-explosives-package design approaches. More generally, LLNL made significant progress on maturing technologies to enhance manufacturability (to lower costs) and improve safety and security options for future LEPs.
- Sequoia. Livermore brought into operation for NNSA's Advanced Computing and Simulation (ASC) Program the IBM Sequoia supercomputer. With 1.6 million cores working in parallel, the machine has performed record-breaking simulations. All three NNSA laboratories have run large unclassified simulations to test the machine and optimize performance. Sequoia transitioned to classified use in April 2013 and has begun running detailed simulations of nuclear weapons physics, in support of stockpile stewardship.
- NIF as a national user facility. NIF began operation as a national user facility at the beginning of fiscal year 2013. In fiscal year 2012, NIF conducted 332 system shots in support of the SSP, other national security applications and fundamental science. NIF has successfully supported important milestones and resolved key issues for the SSP. The laser system demonstrated that it exceeded performance requirements with precision delivery of energy in excess of 1.8 megajoules (ultraviolet) and 500 terawatts of power.
- SSP experiments. In addition to SSP experiments at NIF, LLNL conducted three technically challenging integrated weapon experiments (hydrotests) at the Contained Firing Facility, carried out the 100th special-nuclear-material experiment at the JASPER (Joint Actinide Shock Physics Experimental Research) facility, and reported new results from ongoing plutonium aging studies that indicate that the material continues to age gracefully.

• Deinventory of high-security special nuclear materials (SNM). In September 2012, the last of the SNM items that require Security Category I/II operations were removed from the Livermore site. Through a concerted effort, deinventory of these items was completed 2 years ahead of the original schedule and the Laboratory has transitioned to lower-cost Category III operations with related security operations downsizing and savings for the enterprise.

SUPPORT FOR STOCKPILE STEWARDSHIP SCIENCE AND TECHNOLOGY

The Foundation of Simulations and Experiments

The SSP fundamentally depends on the expert judgment of the people in the program—their skills and ability to resolve with confidence difficult questions about the performance of aging weapons, and to provide LEP options with interoperability and enhanced safety and security features. The SSP is founded on the premise that the knowledge and expert judgment about nuclear weapons developed over generations of constantly designing and testing new weapons can be replaced by succeeding generations who rely instead on theory, detailed simulations, and laboratory experiments as a basis for stockpile assessments and certification of LEPs. In the past, the paradigm was the empiricism of nuclear testing and use of "rules of thumb" where detailed understanding was lacking; now it is science-based stockpile stewardship with the rules of thumb being replaced by a much better understanding of the underlying physics of nuclear weapons.

Experts at the NNSA laboratories now rely on state-of-the-art computer simulations that are tested and verified with experimental capabilities (and past nuclear test data) to do their job. Their understanding of nuclear weapons design and functioning is continually improved through the cycle of theory, simulation, and experiment that is at the core of the scientific method and the SSP. We still have much work to do.

Investments in Supercomputing

In April 2013, the Sequoia supercomputer made the transition to classified work for the SSP. This is a tremendous success for NNSA's ASC program and a major advance in high-performance computing (HPC) capabilities. The machine's extraordinary capabilities are needed to improve models of weapons physics, particularly in the areas of hydrodynamics, radiation transport, and the properties of materials at extreme pressures and temperatures. In addition, Sequoia is able to run large suites of calculations designed to characterize uncertainties in weapon performance resulting from small variations in the weapon system and uncertainties in the physics models used. Improved capabilities for uncertainty quantification (UQ) are essential for assessing the impact on performance of physical changes in aging weapons and for certifying LEPs.

Sequoia provides "entry-level" capabilities to run suites of three-dimension weapons physics simulations for UQ. Even more capable computers are needed to run large suites of high-fidelity simulations to fully map out the impact of uncertainties. Greater capability is also needed to develop predictive models of boost physics and thermonuclear burn processes in nuclear weapons. It is vitally important for the future of stockpile stewardship—as well as to national competitiveness—that we continue to work with industry and the DOE Office of Science to expeditiously advance HPC capabilities, both in the near term and in the development of next generation (i.e., exascale) architectures.

Investments in Nuclear Weapons Experimental Science

Of the experimental facilities supporting stockpile stewardship, NIF is especially important because of its ability to provide data pertaining to nuclear weapon performance that is otherwise inaccessible in the absence of nuclear testing. Some of the experiments provide necessary data as input to simulation models; others provide validation of the performance of models.

NIF is a core experimental capability of the SSP, needed to ensure confidence in the reliability of its nuclear stockpile without a return to nuclear testing.

In particular, NIF uniquely makes accessible regimes of pressure, density, and temperature relevant to the operation of a nuclear weapon. NIF experiments provide data and insights that challenge our modeling and simulation capabilities. The ability to experimentally test the theory and assumptions embodied in our simulation of nuclear weapons is fundamental to stockpile stewardship.

NIF has successfully supported important milestones and resolved key issues for the SSP, and currently has more requests from the SSP community for experimental shots than it has the capacity to provide. In addition to its role in the SSP,

NIF executes experiments for NNSA nonproliferation and Department of Defense (DOD) applications, and supports fundamental science. One important consequence of the efforts of the academic community on NIF experiments is the pipeline of young researchers that come to the Laboratory and ultimately to the SSP. NIF began operations as a user facility for high-energy density science in fiscal year 2013.

NIF is one of the largest scientific construction projects successfully completed by the DOE, an accomplishment validated by the prestigious International Project of the Year Award in 2009. The laser system meets or exceeds all of its performance specifications and NIF is the world's leading scientific facility for high-energy-density science and inertial confinement fusion (ICF) research. It is worth noting that every major nuclear power that has abjured nuclear testing (other than the UK, which uses the NIF)—Russia, China, France—has a NIF-like facility either under construction, or planned. Laboratory experimental access to the conditions present in an operating nuclear weapon cannot be currently achieved any other way.

NIF has made steady progress towards demonstrating fusion ignition; realizing this goal is important to more fully understand key aspects of nuclear weapons physics, and also for retiring the physics issues associated with inertial confinement fusion energy (IFE). The ongoing experimental program at NIF balances experiments for stockpile stewardship—work on ignition and other experiments that do not require ignition—as well as experiments for other national security missions and for fundamental science.

Our efforts on ignition are guided by NNSA's Path Forward to Achieving Ignition in the Inertial Confinement Fusion Program, the November 2012 Report to Congress issued by NNSA as requested by the U.S. Senate Committee on Appropriations, Subcommittee on Energy and Water Development. This guidance on the path forward is based on the technical judgment of the broad nuclear weapons and ICF community. The report stresses the importance to the SSP of achieving ignition or if concerted efforts do not succeed, understanding in detail why the goal is out of reach. The ignition plan calls for over 400 shots over 36 months and critical new capabilities. The pre-sequestration NIF fiscal year 2013 budget could have enabled considerable progress towards meeting the goals of the NNSA Path Forward plan.

The rationale for NIF, as espoused by DOE (and later NNSA) from the beginning was primarily for its role in stockpile stewardship. However, that rationale also acknowledged NIF's importance to fundamental science, and for addressing the physics issues associated with IFE production. A recently issued National Academy of Sciences study stated there is "a compelling rationale for establishing inertial fusion energy R&D as part of the long-term U.S. energy R&D portfolio." The study also noted that "planning should begin for making effective use of the NIF as one of the major program elements in an assessment of the feasibility of IFE." Significantly, the path toward achieving ignition does not depend on whether the goal is assuring the safety, security, and reliability of the nuclear stockpile, or creating a sustainable source of clean energy.

Reductions to NIF in the Fiscal Year 2014 Budget Request will cause real harm

The President's budget request cuts $80 million from the unsequestered fiscal year 2013 operating budget for NIF—a nearly 25 percent reduction that comes on top of a $30 million reduction that occurred in the prior year. The proposed reductions are based in part on an operational and business model for NIF operations that is neither founded on standard practice for the use of scientific facilities, nor founded on an informed analysis of NIF operations and costs.

The business model proposed—a "pay-as-you-go" model for users—fundamentally differs from the best practices employed at DOE Office of Science user facilities and other national and international leading-edge-science experimental facilities, and differs as well from the Readiness in Technical Base and Facilities (RTBF) approach routinely followed by NNSA. The scientific facility operations model recommended by a 1999 National Research Council (NRC) report and adopted by DOE for all of its scientific user facilities found that " . . . history has demonstrated that if core operations and maintenance become dependent on dispersed funding, the entire facility operation may be threatened by the reduction or withdrawal of support by a single component." Adherence to this principle has been critical to DOE's strong record of success in operating major scientific user facilities. This NRC-recommended model is also used by the National Science Foundation (NSF) and other Federal agencies such as the National Aeronautics and Space Administration (NASA).

Analysis demonstrates fundamental flaws with the approach. Importantly, the vast majority of users on NIF are from the SSP, funded by NNSA. The plan for fiscal year 2013 shots is instructive: over 90 percent are in support of SSP. The non-SSP shots support NNSA nonproliferation, DOD, and the fundamental science com-

munity. It is important to note that the fundamental science community simply cannot afford to pay, so their research will simply not get done. Moreover, DOD and non-proliferation users have not included those costs in their planning. This is why under the NRC model, scientific user facility operations are funded separately—and fully. Hence, the proposed model for NIF would eliminate use of NIF by the science, DOD, and nonproliferation communities. While the impact of this is high for national security and science, the cost avoidance is small—roughly $6 million per year. Again, it is important to note that the fundamental science community in high-energy-density science and ICF research represents a key pipeline for the future SSP workforce.

A further rationale that we have heard for the $80 million cut to NIF is that an added emphasis on non-ignition-related SSP experiments significantly reduces the cost of operations at NIF. This too is incorrect. The SSP shots are not uniformly lower in energy and power; and hence the resultant cost saving in optics is marginal. Furthermore, the complexity of these SSP shots has been steadily increasing and is equivalent to or greater than those for ignition, often requiring significant new facility capabilities. As such the integrated cost impact of emphasizing non-ignition SSP experiments to the overall program is not significant.

It should be noted that these rationales were not developed in consultation with LLNL management, and hence were not based on experience with the NIF experimental program or operations. If enacted, our current best estimate is that proposed reductions to NIF operations and LLNL's ICF Program budget included in the fiscal year 2014 President's budget request will lead to substantial staff reductions at the Laboratory (approximately 500 staff members down from the level at the beginning of fiscal year 2013), and operational cutbacks that mean that nearly 70 percent of the SSP shots planned for in fiscal year 2014 will not be conducted.

We are acutely aware of the limited resources in our current fiscal environment. However, drastically reducing the budget at a time when the demand for shots from SSP and other NIF user communities far exceeds available shot time is not a prudent use of this great national resource, and the investment that has been made in it. NIF has achieved "full steam" operations in the past year; building the facility and then substantially limiting its use as a user facility is not logical. To significantly cut back operations, disrupt the world-class team supporting those operations, and deplete the NIF user community so soon after completion of the facility, after decades of effort, would not only damage the Nation's national security and scientific credibility, but also lead to a loss of U.S. leadership in this important field. There is also a wider message such a budget cut would send—the message to prospective scientists that might be drawn to a career at an NNSA laboratory to pursue high-energy density science and weapons physics; to nations that might grow to question the U.S. long-term commitment to ensuring an effective nuclear deterrent; and to stakeholders eager to find out whether IFE might be a path to energy security.

NIF was built to support stockpile stewardship and continues to provide essential support to the SSP with a variety of experiments. The data from these experiments fundamentally expands our understanding of the performance of nuclear weapons. So we all have a stake in NIF realizing discoveries about materials at high energy density, ignition, and thermonuclear burn—this is what it is designed to do. Severe budget cuts that curtail achieving such understanding are not the path to success.

The fiscal year 2014 President's budget request also potentially impacts the W78/88–1 effort, especially in the years following fiscal year 2014.

We are concerned that the funding contained in the fiscal year 2014 request for W78/88–1 is not sufficient to support an early down select of the Nuclear Explosives Package (NEP) design for the W78/88–1 and also conduct the technology maturation efforts essential to provide reliable cost estimates for the Phase 6.2A cost study. This early down select will help reduce the scope of the 6.2 effort; Livermore fully supports this activity, and is working with LANL and the NNSA to achieve this goal. But even with an early down select of the NEP, investments in technology maturation during the 6.2 Phase are key to informing warhead down-select decisions, limiting risk mitigation options that would otherwise need to be carried forward into Phase 6.3, improve cost estimates of the down selected design, and increase confidence in successful delivery of the LEP in 2025.

PROVIDING NATIONAL SECURITY IN THE GLOBAL CONTEXT

National security requires not only an effective nuclear deterrent, sustained through the SSP, but also vital efforts aimed at preventing the proliferation or terrorist use of nuclear weapons and other weapons of mass destruction (WMD) or disruption, strengthening the capabilities of our military forces, and bolstering the Na-

tion's energy security and economic competitiveness. At LLNL, the capabilities we have developed for our stockpile stewardship work are leveraged to address these other pressing national security issues, and, in so doing, add depth, breadth, and strength to our scientific and technical base and the expertise of our workforce.

Highlights of recent activities for DOE and NNSA non-Defense Programs, other Federal agencies, and non-Federal sponsors include:

- Treaty verification and nuclear explosion monitoring. LLNL led the modeling and data analysis for the "Pele" test, which was conducted to assess the ability of various technologies to distinguish signatures for weapon development from other activities and determine which techniques could be used for effective treaty verification and monitoring. LLNL is the leader in ground-based nuclear detonation detection and develops improved methods for identifying small explosions amid the background clutter of earthquakes and mining blasts. Our analytic techniques were called into action on February 11, 2013, as seismic signals were detected within minutes of the later announcement by North Korea that it had conducted a nuclear test.
- Support for the U.S. military. LLNL continues to play a leading role in advanced conventional munitions development (which was reported to this committee last year); our conventional weapon designs are being used today in the field and also are supporting emerging new capabilities. Many other examples of our support to the warfighter can be cited: LLNL began development of a novel carbon-nanotube-based material designed to repel chemical and biological agents; LLNL's Counterproliferation Analysis and Planning System (CAPS) is an exceptional tool to assist in planning missions against facilities that support WMD production, and the CAPS capability was called upon scores of times in the past year to provide technical assistance to combatant commanders and to U.S. troops in the field.
- Foreign nuclear weapons analysis. As recent developments in North Korea and Iran have shown, accurate, comprehensive, and timely assessments of foreign nuclear weapon capabilities are critical. LLNL deploys its extensive expertise on these and other countries of concern, and we provide analysis that contributes to decisionmaking at the highest levels, including National Intelligence Estimates (NIEs). We also develop technologies and systems to help the Intelligence Community meet its data collection and information exploitation needs.
- Cyber security. LLNL has created new cyber security capabilities that provide real-time situational awareness inside a large computer network using a distributed approach to monitoring for anomalous behavior. Through our Network Security Innovation Center, we work with private partners to counter the constant attack on commercial, infrastructure, and national security networks and protect critical operations and to develop the next generation of cyber defenders. As the sophistication and intensity of cyber attacks against the United States continue to increase, these and other cyber security projects are more important than ever.
- Tracking space debris. As part of the quest to provide space situational awareness, a "nano-satellite" was launched in September 2012 that contains an LLNL-developed optical system for tracking space debris. A constellation of such nano-satellites is projected to be able to track pieces of space debris with a precision 10 times greater than currently possible, which would greatly reduce the false alarm rate for possible collisions with U.S. satellites.
- New radiation detection materials. LLNL developed new materials for improved radiation detection and discrimination, including a new high-resolution scintillator material that operates at room temperature and that is inexpensive, easily field-deployable and that can be manufactured in large volumes. LLNL, working with NNSA, DHS, and DOD, continues to lead the Nation in the development of new capabilities that improve discrimination (important for determining whether a source is benign or a threat), and replace legacy (and poorly performing) systems.
- Biodetection and countermeasures. Licensing of the Lawrence Livermore Microbial Detection Array will enable law enforcement, food-safety professionals, physicians, and others to detect within 24 hours any of thousands of bacteria, viruses, or toxins that have been sequenced. New insights into the interactions of potential drugs with pathogens, gained through modeling using LLNL's world class high performance computing resources, are helping speed the development of medical countermeasures to biothreat agents.

• Energy security, HPC, and industrial partnering. LLNL is partnering with industry to accelerate the development of energy technologies. Of particular note is that we are working with the California Public Utilities Commission, through the California Energy System for the 21st Century project, to leverage LLNL's (unclassified) high performance computing resources deployed at the Livermore Valley Open Campus in a 5-year collaborative effort with the utilities to improve the State's energy grid.

These efforts sustain the vitality of the Laboratory by extending existing core competencies and building new strengths in multidisciplinary science and technology, which in turn benefit the stockpile stewardship mission and national security.

Attention to the long-term health and vitality of LLNL is an overarching responsibility of mine. We are working to expand these efforts, which is a significant challenge at a time of austere Federal budgets and limited economic growth. Actions to help lower operating costs at the NNSA laboratories and simplify the processes for arranging interagency work would be greatly beneficial.

OVERSIGHT AND GOVERNANCE

There have been a considerable number of studies and discussion over the past few years about the oversight and governance of the NNSA laboratories. Most recently, the 2013 National Defense Authorization Act established a Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise to examine this issue. I applaud this action and offer up some broad observations for consideration.

Policies governing the laboratories have many masters.

Disparate offices in NNSA and DOE HQ and the Field Offices (with at times conflicting voices) all generate the policies regarding the conduct of operations at the laboratories and production plants. The laboratories and sites could function more efficiently with a single determining voice on policies regarding safety, security, legal, accounting, etc. That voice needs to be close to the mission in order to appropriately weigh the impact of policy on mission delivery. Any oversight and governance construct could be tested with this key question: how and at what level is the impact of policy on mission performance weighed against the resultant proposed risk reduction?

To the extent possible, policy should be made by exception in those cases where Federal, State, and local laws and regulation, or international standards apply.

This is how DOD manages its federally-funded research and development centers (FFRDCs). The large majority of rules the laboratories operate under have little if anything to do with nuclear operations, and my remarks especially focus on those areas. To the extent that policies are required to supplement broader Federal, state, and local laws and regulation, or international (e.g., ISO) standards, the policies that are necessary should not be prescriptive in terms of how they are to be implemented, but rather in terms of desired goals. Furthermore, policies or directives should be accompanied by a cost benefit analysis, and conducted in partnership with Laboratory management. Specific implementation should be left to laboratory management, which in turn should be held accountable (provided adequate resources are provided for implementation). Performance against these goals should be audited centrally to ensure uniformity across the complex.

It is important that any construct for governance provide a credible advocate for the mission to DOD, the White House, and Congress.

The governing agency needs a robust planning, programming, and budgeting system integrated over its portfolio of programs. Furthermore, that function should include a credible independent cost estimation capability. In analogy with how DOD operates with the military services, the cost estimation capability would not be a substitute for the process led by the laboratories, but rather ensure that the right questions get asked. An effective budgeting and planning function is essential for establishing credibility with the various stakeholders. In my view, that capability needs to be implemented immediately, and aggressively.

The FFRDC construct that has served the Nation so well for decades has been stood on its head.

In principle, the FFRDC concept distributes responsibility and accountability to the contractor for serving the sponsor's (today, NNSA's) mission with excellence, in a secure and safe manner, and consistent with State, local, and Federal laws and regulations. Hence, the need for equivalent responsibilities and accountabilities on

the government side is largely obviated. That is, under this construct, the role of the government is limited: manage the contract consistent with Federal Acquisition Regulations (and DOE FARs, or DEARs) to ensure performance objectives are met; set standards (e.g., require compliance with ISO or other international standards); advocate for the mission within the government; develop, implement, and rationalize a budget; make capital investments; and take those actions needed to assure the excellence and sustainability within existent policy and budgetary constraints.

Under this construct the FFRDC is held accountable, and the government is expected to hold regular financial and performance audits and reviews. If there are too many security or safety incidents, the employees concerned are disciplined or let go, and/or the institution fined. If concerns arise within a particular institution regarding mission performance, or if it appears to have systemic issues, the government can demand that the FFRDC change leadership or in extreme cases, the government can recompete the Management and Operations contract. This philosophy guides how DOD works with its FFRDCs, which is in part demonstrated by the fact that the DOD FFRDCs and University Affiliated Research Centers (UARCs) are overseen with greater than one order of magnitude fewer government employees, and very few specific rules and regulations.

What has instead happened within DOE is that the FFRDCs believe they have the responsibilities and accountabilities noted above, but there are also many in DOE/NNSA who also think they have those responsibilities and accountabilities. We have to meet standards for safety and security, but we are also told prescriptively how we should do so. Orders and directives are substituted for perfectly applicable international standards, and laws and regulations. In all too many cases, we are told who we can hire, what we pay them, and how we should manage our workforce. Any governance construct needs to be tested against the consequent mix of roles, responsibilities, authorities, and accountabilities between the FFRDC and the government.

There has been a breakdown in trust between the FFRDC partners and the government.

This lack of trust—highlighted last year by the National Academy of Sciences—should concern us all. The FFRDCs ensure that the work of DOE gets done—we do the mission planning and execution, provide corporate memory, and comprise the dedicated and professional workforce that is the enduring backbone of the enterprise. The FFRDCs are not simply "contractors" but rather are partners (and have been without interruption for decades) to the government. This difference is well understood within DOD and NASA. DOD and NASA treat their FFRDCs and UARCs as trusted mission partners, in sharp distinction to how they work with their industrial base. The relationships are enduring, and not limited by the timeframe of a particular contract.

A crucial question against which governance constructs should be tested is how the current culture (embedded across the DOE government ecosystem: DOE HQ, NNSA HQ, and the Field Offices) will be affected.

The existing culture is one of highly intrusive oversight of laboratory operations. It would be dilatory if the result of a new governance model is to simply change the organization chart while keeping embedded the culture and approach that has now been in place for over a dozen years.

Any governance construct should be evaluated in terms of the fundamental relationship between the FFRDCs and the government—in particular, will it foster a dynamic where the government sees itself as one side of an enduring relationship with partners that execute a shared national security mission?

The above observations are offered with the goal of revitalizing the relationship between the laboratories and our governing agency. To succeed in our important mission as we face numerous technical, programmatic, and budgetary challenges, we need a more trusted relationship. We should be operating in a productive partnership with more efficient and effective governance and oversight, a clear understanding of roles and responsibilities, and a shared vision and clear focus on mission. I am ready to work hand in hand with my colleagues in the government and across the complex to forge a stronger partnership.

CONCLUSION

At LLNL, we are undertaking a challenging set of activities to modernize an aging stockpile and sustain a healthy nuclear weapons complex. Effective deterrence requires investments in both LEPs and the supporting science, technology, and production base for stockpile stewardship. We are implementing a strategy for moving forward that is budget constrained. One vital piece of the overall SSP is particularly

constrained in the President's fiscal year 2014 budget request: operation of NIF to collect vitally needed data pertaining to the nuclear phase of the function of a nuclear weapon. For the long-term health of the program, it is important to rectify that imbalance.

It is also important that we revitalize the partnership between the government and its laboratories. Many shortcomings in governance and oversight have been identified in independent studies. It is time to act on recommendations that have been offered, guided by the deliberations of the newly formed Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise.

Senator UDALL. Thank you, Dr. Albright.

Dr. Shank.

STATEMENT OF DR. CHARLES V. SHANK, CO-CHAIR, COMMITTEE TO REVIEW THE QUALITY OF THE MANAGEMENT AND OF THE SCIENCE AND ENGINEERING RESEARCH AT THE DEPARTMENT OF ENERGY'S NATIONAL SECURITY LABORATORIES

Dr. SHANK. Thank you for the opportunity to testify before this committee. For the last 2 years, I have served as Co-Chair of the National Research Council Committee to review the Quality of the Science and Engineering Research at the Nation's National Security Laboratories. Last year, we issued Phase I of our report on the management of science and engineering, and this year, we have a report that is in progress on addressing the quality of science and engineering at the laboratories. That report is being prepared. So what I am going to talk about today will be my personal impressions of the study and all the comments are my views.

First, in assessing quality, one needs to define it, and we decided to define it in terms of the ability of the laboratories to use science and engineering to address mission challenges, both in present and the future, questions such as are the mission needs being addressed today, is there a compelling plan for the future, are the laboratories recruiting and training the next generation of staff, are the tools and facilities on the cutting edge and adequate to meet the mission needs, is there a working environment sufficient to attract and retain high-quality staff.

Because it is no longer possible to test a weapon, understanding safety and reliability must rely and be inferred from science and engineering knowledge. Even though we have studied nuclear weapons for more than a half century, our need to understand science and engineering in detail is likely more compelling today than it has ever been. A detailed assessment of all the scientific activities in these very large laboratories is well beyond the scope of any Nuclear Regulatory Commission.

So we decided to focus on four areas that are really at the core of the missions in the laboratories. Those are weapons science, modeling and simulation, weapons design, and systems engineering.

Jumping to the overall high-level result, we found that the quality of science and engineering at the laboratories, in all the areas that we examined, are sufficiently of high level to allow the laboratories to effectively certify the safety and reliability of the stockpile. Nothing that we observed suggests that the science and engineering underpinning the stockpile stewardship and nonproliferation missions are currently compromised. The quality of these four

areas of fundamental importance that we studied are very healthy and vibrant.

Much has been said recently about an aging workforce that maintains the nuclear stockpile. Significant progress has taken place in the laboratories at NNSA to recruit a new generation of scientists and engineers. The enthusiasm around the capability of these new recruits is really quite impressive.

However, despite these encouraging trends, deterioration in the work environment can limit the Nation's ability to fully benefit from the laboratories' potential. Scientists and engineers expressed to us increasing concerns about impediments of performing experimental work. Experimental work is needed to put into the codes that ultimately model and provide true understanding to the laboratories.

What has happened is that there are many factors that are driving costs to the point where experiments are becoming unaffordable. Many of the factors that drive these costs were talked about in our first study having to do with a loss of trust, excessive duplicative oversight, formality of operations, a culture of audit, risk avoidance across the entire NNSA enterprise without benefit in many cases of a risk-benefit analysis. Often we see an enormous enterprise devised to look at minutiae and often missing the big picture.

The risks inherent in doing an experiment need to be brought into balance with the risks associated with not doing the experiment. Small, incremental increases in safety in the conduct of experiments may, for example, require a disproportionate increase in cost. In no way would we be encouraging anyone to do experiments or any activity at the laboratories where appropriate safety precautions were not taken, but a look at costs and the cost-benefit, in my personal view, would be very important to make them more efficient.

All three laboratories maintain a high-quality recruiting effort, acceptance rates from graduate schools from which postdoctoral and other staff are recruited—the people they have been able to recruit are impressive, and they have remained constant over the years.

However, there are some reasons for concern. A supporting and nurturing work environment fosters the ability of highly creative scientists and engineers to do their work while encouraging the retention of senior staff and the recruitment effectively of younger staff. I am going to just pick out one area here which I find particularly important and something that to scientists means a great deal, and that is the ability of scientists to interact with each other.

Scientists in the national security laboratories are isolated from the world of broader science due to the classification and nature of their work. Recently imposed restrictions on traveling and conference attendance creates a kind of isolation. It limits career development, access to the latest scientific advances, and the ability of scientists and engineers to bring the full range of their relevant science to bear on work in the laboratories. From my own personal experience, many of the ideas that really helped advanced my personal science had to do with things that I learned in interactions at conferences.

But if you could imagine the need for someone to attend a conference requires a 60-day notice, followed by often not being able to be told whether you could attend the conference or not, maybe just days before, and then having to buy very expensive tickets to attend that conference. I must say in my personal experience as a scientist over the years, the only place that I have ever seen travel restrictions operating in this was with scientists from the former Soviet Union who were trying to attend conferences in the United States. They often did not show up at the last moment, and there was a process that none of us understood. I think we are in a very similar environment at the moment.

In conclusion, the laboratories retain a core of talented and dedicated scientists and engineers who have very willfully and enthusiastically accepted responsibilities for stockpile stewardship and related activities. Constant vigilance will be required to assure that the work environment enables this workforce to perform at a high professional level in order to execute their mission.

[The prepared statement of Dr. Shank follows:]

PREPARED STATEMENT BY DR. CHARLES V. SHANK

Thank you for the opportunity to testify before this subcommittee. For about 2 years I have served as the co-chair of the National Research Council Committee to review the quality of the management and of the science and engineering research at the Department of Energy's National Security Laboratories. Last year I was honored to appear before this subcommittee to testify on the first report of that study committee, which reviewed the management of the laboratories. A second report dealing with the quality of science and engineering is currently nearing completion and delivery to this committee. My testimony today, however, represents my personal views which are not necessarily those of the National Research Council (NRC) nor have they been reviewed by the NRC.

The three National Nuclear Security Administration (NNSA) National Security Laboratories—Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), and Sandia National Laboratories (SNL)—are a major component of the U.S. Government's laboratory complex and of the national science and technology base. These laboratories are large, diverse, highly-respected institutions with broad programs in basic sciences, applied sciences, technology development and engineering; and they are home to world-class staffs and facilities. Under a recent interagency agreement among the Department of Energy, the Department of Defense, the Department of Homeland Security, and the Intelligence Community, these laboratories are evolving to serve the needs of the broad national security community. Despite this broadening of substance and support, these laboratories remain the unique locus of science and engineering (S&E) for the U.S. nuclear weapons program, including, most significantly, the science-based stockpile stewardship program and the S&E basis for analyzing and understanding nuclear weapon developments of other nations and non-state actors.

The National Research Council (NRC) was asked by Congress to assess the quality of S&E and of the management of S&E at these three laboratories. On February 15, 2012, the NRC released a report on the quality of the S&E management.[1] A second report—currently in preparation—will address the quality of S&E. In order to conduct this assessment of quality of S&E, the NRC assembled a committee of distinguished scientists and engineers. Some members of this committee also served on the committee that produced the management report, but most did not.

Assessing the quality of S&E in a meaningful way within the context of the primary nuclear weapons mission of the laboratories requires taking a broad perspective, both in substance and in time. Referring to criteria developed by the NRC Laboratory Assessments Board and to other sources, the committee chose to define the quality of S&E as the capability of the laboratories to perform the necessary tasks to execute the laboratories' missions both at present and in the future: Are the lab-

[1] Managing for High-Quality Science and Engineering at the NNSA National Security Laboratories Committee to Review the Quality of the Management and of the Science and Engineering Research at the Department of Energy's National Security Laboratories—Phase I, February 15, 2012.

oratory mission needs being addressed today? Is there a compelling plan for the future? Are the laboratories recruiting and training the next generation of staff? Are the tools and facilities at the cutting edge and adequate to meet mission needs? Is the working environment sufficient to attract and retain high quality staff?

The Nation faces major S&E challenges that extend well into the future. The country has an aging nuclear weapons stockpile, with many of the weapons being decades old. The last nuclear weapons test was conducted before the United States declared a unilateral moratorium on testing in 1992.[2] Because it is no longer possible to test a complete weapon, understanding of the safety and reliability of the nuclear weapons stockpile must be inferred from relevant S&E knowledge. Furthermore, the country faces threats from the development of improvised nuclear weapons (i.e., terrorist nuclear weapons) and nuclear weapons designed by nations seeking to become nuclear powers (such as Iran and North Korea). Understanding and evaluating the threat from such developments—including those that are based on novel design approaches rather than on designs that the United States or its allies have been able to study first-hand—is of vital importance. Even though we have more than a half-century of experience with nuclear weapons, the need to understand their S&E in detail is likely more compelling today than it has ever been.

An all-encompassing detailed assessment of the quality of S&E at the three NNSA laboratories is a complex task requiring resources far beyond those available to this committee. Instead, we chose to sample a set of activities that are part of the core mission of the laboratories. This assessment is a snapshot of the present with an eye to the future. The committee identified four basic pillars of stockpile stewardship and nonproliferation analysis: (1) the weapons science base; (2) modeling and simulation, which provides a capability to integrate theory, experimental data, and system design; (3) weapons design; and (4) system engineering and understanding of the effects of aging on system performance. The study committee organized itself into four teams, each of which focused on one of these areas.

The challenge facing the nuclear weapon design community in the coming decades is the certification of the performance of weapons that have aged and in some cases have not been tested in the underground test program. Aging—the changes over time in materials and component systems of nuclear weapons—may affect the performance of the weapon. In the absence of the ability to test an aged weapon, an understanding is required of what the aging effects are and how those would affect weapon performance. Life Extension Programs (LEPs) are motivated by aging and by evolving requirements to improve safety, reliability, and other performance characteristics. LEPs now underway sometimes require the incorporation of components that are not identical to those in the original weapon because the exact material is not available, possibly because its manufacturing process has evolved. Predicting the performance of weapons systems whose components are not exactly the same as they were when tested decades ago requires precise S&E knowledge. A strong, systems engineering function is the core integrating activity for the results of high-quality scientific research, development, engineering, and manufacturing. Examples of the importance of high-quality systems engineering are the recent W–76 LEP[3] and the B–61 LEP currently underway.

Computer modeling and simulation is the key tool for integrating all the knowledge and information about the safety and reliability of a weapons system. For the present, the modeling and simulation capability provides important and effective tools to certify the performance and safety of the stockpile. The quality of the research staff and the availability of underground test data allow models of key physical processes to be fine-tuned to actual data.

The quality of S&E at the laboratories today—across all four of the pillars it examined and across all three laboratories—appears to be at a sufficiently high level to allow the laboratories to effectively certify the safety and reliability of the stockpile. Moreover, in many areas S&E is of very high quality judged in the wider context. Nothing observed would suggest that the S&E underpinning the stockpile stewardship and non-proliferation missions are currently compromised. S&E quality in these four areas of fundamental importance is currently very healthy and vibrant.

In recent years much has been said about the aging work force that maintains the weapons stockpile. Significant progress has taken place in the laboratories and

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[2] 50 U.S.C. 2530. In addition, the United States has signed, but not ratified, the 1996 Comprehensive Test Ban Treaty (CTBT), and is therefore committed under the Vienna Convention on the Law of Treaties to refrain from actions that would defeat the object or purpose of the CTBT pending entry into force.

[3] The first delivery of refurbished warheads to the Navy was in 2009. Production is to be completed no later than 2021.

the NNSA to recruit a new generation of weapons designers, scientists, and engineers. The enthusiasm, morale, and capability of the new recruits is impressive. Efforts are being made at all the laboratories to transition information from experienced members of staff to the next generation that will have never seen a weapons test.

Despite these encouraging trends, deterioration of the work environment for scientists and engineers can limit the Nation's ability to benefit fully from the laboratories' potential. Looking across the four pillars of stockpile stewardship and nonproliferation examined in this study, several major themes emerge. These themes are to varying degrees common to each of the pillars. These themes in most cases concern aspects of capabilities—impediments to performing experimental work, balance among experimental facilities, facilities and infrastructure, strategic planning and workforce allocation, communications, and workforce issues. Maintenance of the stockpile is a long-term effort extending at the very least decades into the future. While planning for that future should be possible, S&E professionals at the laboratories are frustrated with inconsistent funding from year to year, which leads to inefficiencies, waste, and in some cases a discouraged work force. Many S&E professionals reported having to piece together support from multiple programs. The laboratories appear to be losing some mid-level managers who desire a more stable work environment.

Looking at the longer term, uncertainties in the stockpile certification process will tend to grow unless steady progress is made against S&E challenges. The laboratories recognize the need for new physics-based models to replace some current key models that are based on empirical data from nuclear tests. The new models will have to account for weapons aging due to changes in materials and their properties; this requires cutting edge S&E results. New data will have to be acquired from experiments other than disallowed testing, but the cost of performing the necessary experiments is escalating dramatically. This is a major concern and must be addressed.

Scientists and engineers (and managers) in all pillar areas expressed concern about impediments to performing experimental work. There appears to be a consensus that the amount of experimental work has declined and continues to decline. Laboratory staff cited increasing costs and increasing operational restrictions and controls on experimental work. Necessary experiments are very costly and can require multiple approval steps. This is especially true for experiments using radioactive or otherwise hazardous materials, which are often the key materials in nuclear warheads. For high-explosive-driven hydrodynamics experiments (Hydro Shots), a key part of the primary design and certification process, the time scales involved are months to years, and the costs run into the millions of dollars. If these trends continue and escalate, they could contribute to driving costs to the point where the experiments will not be affordable. Factors driving experimental costs include: the loss of trust, excessive duplicative oversight, formality of operations, and a culture of audit and risk avoidance across the NNSA enterprise without balance from risk/benefit analysis. A number of such factors were discussed in the first report from this study,[4] including the loss of trust, excessive duplicative oversight, formality of operations, a culture of audit and risk avoidance across the NNSA enterprise without taking advantage of risk/benefit analyses. All experimental activities have inherent risk, which must be balanced against the benefits that derive from conducting the experiments if reasonable decisions are to be made. It is in the Nation's best interest to stabilize the conditions for safe, secure, cost-effective mission success. The risks inherent in doing an experiment need to be brought into balance with the benefits of doing the experiment and the associated risks of not doing the experiment. This needs to be done on a logically sound basis in order to guide important decisions and resource allocations. While no one is advocating irresponsible behavior, the critical need for experimental work must be weighed against the mounting disincentives facing it. Small incremental increases in safety in the conduct of experiments may, for example, require a disproportionate increase in cost. All experimental activities have inherent risk, and successful organizations manage that risk in a manner that allows the work to be performed cost effectively with proper regard for safety. It must be recognized that not carrying out the needed experiments imposes a risk to the ability of the NNSA laboratories to build the capabilities for stockpile certification down the road, which could increase the risk to national security.

[4] See Phase 1 report Chapter IV, pp.22–27

The laboratories maintain and operate world-leading major facilities—such as DARHT,[5] NIF,[6] Z,[7] and petascale[8] computing centers. These major facilities are vital to the execution of the laboratories' mission. Smaller facilities are also crucial for executing this mission, and they are an important component of the work environment that attracts new talent and retains experienced staff. Examples of such smaller facilities include: specialized capabilities for the production of nuclear weapons components such as neutron generators; facilities that enable processing and experimentation with plutonium, especially to evaluate its long-term aging; and capabilities for developing radiation hardened microelectronic components, photonic related components, and beryllium parts fabrication. The rising costs of building and operating large signature facilities can threaten the continued support of such vital smaller facilities, particularly in periods of greatly constrained budgets. Moreover, because signature facilities have greater public and political visibility and can be seen as being inextricably bound up with a laboratory's fate, there can be understandable pressure on management to sacrifice other capabilities in order to ensure the continuing support of major facilities.

The quality of infrastructure is uneven, ranging from world-leading to unsatisfactory. At one extreme, the NIF at LLNL is a world-leading facility of impressive design and engineering. At the other extreme, at the same laboratory (and at the others as well) there are facilities that are considered to be of poor quality, including some at which scientists and engineers report having to perform basic housekeeping functions in order to be able to conduct their work. Examples of old and poor quality facilities include the explosives test facilities at Los Alamos. Many important facilities and other infrastructure are deteriorating, including buildings that house important, expensive, and advanced equipment.[9] This situation can erode morale and the ability of the laboratories to recruit the best young people. Funding difficulties resulting from Federal budget uncertainties clearly make it very difficult to address this issue. Nevertheless, continued careful monitoring by NNSA and Lab management is essential in order to set appropriate priorities for facility improvement.

Computer modeling and simulation is an important component of the weapons program, In the absence of underground testing, the integrated modeling codes (IMCs) provide the only mechanism for assessing the effect on the whole weapon of differences in materials and manufacturing processes relative to those used in the original design. Thus, as these differences increase and underground test data becomes a decreasingly reliable method for calibrating the codes, the requirements for fidelity of physical models and accuracy of the numerical methods in the IMCs will increase in order for them to play their required role in the stockpile certification process. At the same time, the architectures of the processors from which high-performance computers are constructed are undergoing disruptive changes, which will lead to a need for a major software redesign of the IMCs. Finally, the IMC development teams and the developers of supporting software have simultaneously seen the resources available to them decrease (the size of the code teams are down by a third relative to the late 1990s), while their missions have increased from the support of stockpile stewardship to include a number of other areas, such as counter-proliferation and life-extension programs.

All three laboratories maintain highly qualified, productive work forces. Statistics for recruitment—such as acceptance rates and the graduate schools from which postdocs and other early career staff are recruited—are impressive and have remained constant over recent years. Attrition rates are low and relatively steady. The study committee met with many people who are enthusiastic and apparently pleased with being at their laboratories. However, there appear to be some reasons for concern. For example, numerous, and widespread, complaints were expressed about deteriorating conditions at the labs. As recounted in the report of the first phase of this study, these complaints focused primarily on infrastructure and a perceived increasing burden of rules, regulations, operational formality, constraints and restrictions, and administrative burdens. Furthermore while there have not been significant negative changes in recruitment and retention, some of this continued success may be due to the state of the economy since 2008; an improving economy may produce better opportunities outside the laboratories. In some disciplines, it appears that mid-level managers have been leaving for a more stable work environment.

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[5] The Dual Axis Radiographic Hydro-Test (DARHT) facility at LANL

[6] The National Ignition Facility at LLLNL

[7] Z Pulsed Power Facility at SNL, also known as the Z machine or the Z pinch facility

[8] Computing facilities capable of performance in excess of one petaflop, i.e. one quadrillion floating point operations per second.

[9] This matter was discussed in the phase 1 report.

NNSA and the laboratories should pay close attention to the problem of hiring and retaining a cadre of first-rate, creative, energetic scientists, expert in all aspects of modeling and simulation, ranging from deep understanding of the underlying physics and mathematics to the most advanced ideas in computer architectures, algorithms, and programming methods. There is uncertainty concerning staff's ability to make good use of future high-performance computing systems. Expected disruptive changes in computer architectures will require very high levels of computer science expertise in order to create the software to exploit the new capabilities. There is particular concern in core computer science areas, such as computer architecture, systems software, programming models, tools and the algorithms used in these systems. While there are some outstanding individuals in these areas within the labs, there were also signs of difficulty in recruiting and retention. Among laboratory scientists and engineers, these researchers are the most mobile, because they can easily find challenging and lucrative employment in industry— while their work is necessary to the NNSA mission, they have other good options. These researchers and engineers appear less likely to come to the labs and more likely to leave mid-career than those working in other disciplines.

Maintaining a quality workforce in the face of budget uncertainty and competition from other employers will be very difficult. An atmosphere nurturing broad scientific investigation and intellectual excellence, along with the ability to pay salaries that are competitive with industry are the keys to maintaining the laboratories' M&S capabilities.

A supportive and nurturing work environment fosters the ability of highly creative scientists and engineers to do their work while encouraging the retention of senior staff and the recruitment of young staff. The work environment at the laboratories, however, appears to be deteriorating and is at risk of further deterioration.[10] Early-career people at the laboratories expressed concern about time accounting restrictions that seem to limit their working on new ideas at home or on weekends. Some observe that excessive fractionation of their chargeable time among several tasks reduces productivity and efficiency. Inconsistent and unpredictable funding was also cited, along with conflicts between short term project demands and sustained scientific progress.[11] Scientists in National Security Laboratories are isolated from the broader world of science due to classification and the nature of their work. Recently imposed restrictions on traveling to conferences adds to this isolation, limiting career development, access to the latest scientific advances, and the ability of scientists and engineers to bring the full range of relevant science to bear on their work at the laboratories.

Final integration of the advances and understanding in weapons simulation, analyses, design and materials sciences and technology is a critical activity for the science-based stockpile stewardship program. The integration activities fall under the general areas of systems engineering. Systems engineering is also important in the LEP, in which the importance of training the next generation of scientists and engineers cannot be overemphasized. Special projects often help bring the established and the new systems engineering personnel together to assure the health and vitality of systems engineering expertise into the future.

In early 2012 (January to May), the three laboratories fulfilled a request from NNSA to conduct a 120 day study to evaluate alternatives for warheads to be deployed in multiple reentry vehicle systems, and to inform NNSA on potential options for future life extension programs (LEPs). The "120-day study"[12]—which considered advanced options for the nuclear physics package and various approaches on how to configure the stockpile using existing components and systems with an emphasis on raising the levels of safety, reliability, and security—provided an example of how a team was created consisting of a few experienced designers, several mid-career designers, and a large number of near entry level designers who were given the opportunity to develop timely and workable design solutions within customer constraints. By bringing together scientists and engineers from these different career stages, it provided a mechanism for transmitting information and experience in a productive manner, and helped develop useful practices. The 120-day study is an example of

[10] See phase 1 report, chapters IV and V.

[11] This matter was also addressed in the phase 1 report—see, for example, p.17. That report noted that the four agency agreement on national security laboratory governance was an important step in fixing this. In the past, task orders from agencies other than the Department of Energy were often designed to exploit lab staff and infrastructure to obtain a specific product without investing in the development of staff or facilities.

[12] January 10, 2012 NNSA officially requested that LANL, LLNL, and SNL perform a 120-day study to evaluate alternative warhead designs and to inform NNSA on potential options for future life extensive programs.

a best operational practice that demonstrates the high quality of the systems engineering capabilities within the complex.

In conclusion, the Laboratories retain a core of talented and dedicated scientists and engineers who have accepted the responsibilities of the stockpile stewardship program and related activities. Constant vigilance will be required to assure that the work environment enables this workforce to perform at a high professional level in order to execute their important mission.

Senator UDALL. Thank you, Dr. Shank.

Now we can go to some questions, and I will recognize myself for 8 minutes and then we will turn to Senator Fischer. So let me start with Dr. McMillan.

Dr. McMillan, as my opening statement mentioned, your major LEP with the W76 warhead is closing out. The B61 LEP is primarily occurring at Sandia.

Are you having problems, given that situation, retaining key scientific personnel in the weapons program?

Dr. MCMILLAN. Not specifically for those reasons, Senator. What we are seeing—and this goes to some of the comments that Professor Shank mentioned—are some of our early- and mid-career folks leaving at rates that are higher than those who have been there for extended periods. But today, as I look forward to the LEPs that are to be done—so here I am thinking particularly of the W88/78 that we talk about—I see challenges that remain for our weapons scientists. So I see the challenges remaining, but I do have growing concern for our mid-career and early-career workforce.

Senator UDALL. I know we will continue this discussion, I think, through the rounds of questions with the other lab directors.

Let me turn to the CMRR, which you are well aware of. Last year, the administration postponed the construction of the main portion of that building for at least 5 years. This caused quite a bit of controversy on many fronts. In your opinion—and you spoke to this in your statement too—what can we learn from this and what do you recommend going forward and why?

Dr. MCMILLAN. Let's see. Let me go back just a moment because we often think of CMRR as a recent phenomenon. I was talking to one of my predecessors. The issues of CMRR go back to about 1983.

The current design that we were working on until a year ago was a design that was put in place in 2003, and because of changes in program, changes in our understanding of the cost associated with that facility, and changes in budget, we—"we" meaning in particular the Government—have made a decision not to move forward with that right now, to delay it.

Over the last year, we at Los Alamos have worked very hard to try to develop other options, and in particular, the other option that we brought forward to the Government for consideration is something that we call the modular approach. We recognize that it has been very difficult to build a facility that really does everything at once. So like we build submarines one at a time, we are looking at the question, can we build one module at a time that will provide capability when it is finished so that we can use it, we can learn from that building, and if necessary, build another. That is the path forward we have laid out as an option for the Government.

Senator UDALL. Let me turn to plutonium science. Are you concerned about the quality of plutonium science with the deferral of the CMRR? What can we do to maintain that quality of plutonium science?

Dr. MCMILLAN. I am concerned that we maintain the quality of that science. As we have been looking at options, one of the things I have personally addressed with the team and I know they have addressed because they have come back and told me is that not only do we have to have the ability to build pits, we have to have the ability to do the scientific work that ensures those pits for today and for tomorrow. So the options that we have put on the table are options that include the plutonium science.

Senator UDALL. I think I hear you saying that although it would be convenient to assume that plutonium science has discovered everything that there is to discover and that a plutonium pit is a plutonium pit, that, in fact, is not the case. That is, of course, as well the culture of the laboratory that you head.

Dr. MCMILLAN. That is exactly correct, Mr. Chairman.

Senator UDALL. Constantly pushing forward looking——

Dr. MCMILLAN. That is right. We have studied plutonium now for 70 years. This is our 70th anniversary. There are still unknowns.

Senator UDALL. Thank you for that.

Dr. Hommert, I am going to turn to you and talk about the B61 LEP. It is primarily a Sandia-led effort. Are you able to hire and maintain the right skills mix for the next 5 years to continue through the mission?

Then let me have you comment on the second part. What happens to these people after the B61 effort?

Dr. HOMMERT. To answer that, let me first put the laboratory in a little broader context. For over 30 years, the laboratory has diversified, and today we are truly a national security laboratory with roughly 50 percent or so of our staff working directly on the nuclear weapons program, including the B61, the other part of the laboratory involved in a wide range of other national security efforts.

When we were confronted with the challenge of staffing the B61, we have done that through a combination of two primary mechanisms. We have moved people with synergistic skills in engineering and program management and the right science from other programs to the B61 with a natural phasing to minimize the impact on these other programs. Of course, we have recruited because it is very important that we are training a new generation of scientists and engineers executing this program.

We have been successful in both of that, and today the program is staffed at a level consistent with our budget. I will return to the budget comments, I am sure, shortly. I also want to emphasize we have achieved that with essentially almost no change of the topline employment at the laboratory. So, again, we have either replaced with new people separations or retirements, or we have moved within the laboratory. So the top line is roughly constant.

Regarding the long-term, as we look forward across the modernization efforts—there is the B61, the W88, the issues that my colleagues have mentioned in the W78/88—we see 10 to 15 years

of very significant activities that we expect these young staff that we have brought to be gainfully employed executing those programs and, again, in a broad institution like ours, we do not anticipate any difficulty providing them with rewarding careers in national security for 30 years or more.

Senator UDALL. Let me turn to the replacement fuze for the W88 submarine warhead. You know it is also common or joint with the W87 intercontinental ballistic missile (ICBM) warhead, and it should eventually work with the replacement of the W78 ICBM warhead.

Are you concerned about too much design work at Sandia possibly leading to concurrency at the production sites like the Kansas City plant?

Dr. HOMMERT. No, not really. I believe that the current plan—again, if we can execute the current schedule as it is laid out—has given consideration to phasing the development. For example, the first production unit of the B61, which we hope will be in fiscal year 2019, budgets permitting, is phased very appropriately with completion of the W76–1 production. Similarly, because of a fair degree of commonality that we are doing on this, it is going to reduce the total production load that is required component-by-component, and that allows us to phase in and be able to accomplish what we need to do on the W88 and on the fuze because there is only a small section that we are doing on the W87. So overall, I believe that those plans are achievable, at least as currently laid out. Yes.

Senator UDALL. As is currently laid out. I think that is an important insight.

Let me ask a final question. It is my understanding that the Sandia contract is up for renewal in about 2 years' time, given that the combined Y–12 Pantex contract could possibly reopen by the recent Government Accountability Office (GAO) review. Are you worried about a similar effect happening at Sandia and causing a disruption with the large workload that you have?

Dr. HOMMERT. Mr. Chairman, as a point of fact, our current contract expires September 30 of this year. There are two 3-month extensions possible that the NNSA can choose to elect. So I do not know personally the timing that NNSA or DOE plans on this competition or recompete on the contract.

Ever since the announcement for that was made in December 2011, our focus, particularly in these turbulent times, of staffing the B61 and executing the programs has been to minimize that disruption. The more certainty that can be brought not about the outcome of a competition but principally around the timing of a competition is helpful in minimizing the disruption. Naturally I am concerned that protracted uncertainty is not helpful, but I believe we can achieve what is on our plate if we can minimize that disruption and that is our intent.

Senator UDALL. Thank you.

Again, let me recognize Senator Fischer.

Senator FISCHER. Thank you, Mr. Chairman.

If I could, I would like to follow up, Dr. McMillan, on the plutonium strategy part, the CMRR. You spoke about the modular approach. When was that modular approach to replace the CMRR

building first proposed, and why has it taken so long for the administration to assess the feasibility of that concept?

Dr. MCMILLAN. Let me just add a little to my earlier comments because there is more to the strategy than just the modular approach. There really are three elements in our strategy.

First, is more effective use of facilities that we have today in part made possible by decisions that our partners in NNSA have made. As an example, with the newly constructed Radiological Laboratory/Utility/Office Building (RLUOB) facility that is coming on line right now, we are being able to use analysis that was done in 1992 to move from a 6 gram administrative limit to a 26 gram administrative limit. That makes a big difference in how useful that facility is.

Second, because of changes in how much material we can send away from our facility—and this is particularly referring to PF4, which is our large plutonium facility. Cold War plutonium was very scarce. As a consequence, we had the ability to recover almost every gram of plutonium. That took up nearly a quarter of the floor space in PF4. So on one side of PF4, we were developing the technologies that will turn plutonium into oxide, and on the other side, we were recovering almost every gram. This did not make sense. So we have proposed to the Government to say, let us send more of that material to the Waste Isolation Pilot Plant (WIPP), as an example. That reclaims very valuable floor space.

Yes, Senator?

Senator FISCHER. If I may interrupt, why did it not make sense? Because you did not have the space to store it in your facility and you wanted to store it elsewhere or why?

Dr. MCMILLAN. No. It did not make sense because we no longer had the shortage of plutonium that happened in the Cold War. That is why it did not make sense.

So reclaiming that very valuable space is the second part of our strategy.

The third part of the strategy is the modular construction.

Senator FISCHER. Are you still concerned, though, about reclaiming all of it?

Dr. MCMILLAN. No. We do not believe that that is necessary for the Government to do. Again, we have been working with our partners in NNSA to make that part of the policy environment in which we can operate.

Those three things taken together are what compose our plutonium strategy and why we believe that we can extend the life of PF4 by taking the highest risk materials out of that facility into the modules, and use that very valuable nuclear space that we have in a way that was different than in the past.

A logical question is, why did we not do this in 2003? The answer is, we were in a different programmatic space in 2003. Today our partners have said, let us look at other options. This is part of what I mean when I say challenging assumptions. These are examples of assumptions we have challenged in the last year. So the decision to delay CMRR, coupled with decisions about policy changes, have opened options we did not previously have.

Senator FISCHER. So do you believe then that the delays are happening because you are challenging the assumptions and looking to go the best way forward?

Dr. MCMILLAN. We believe that we can execute the strategy we have laid out, provided there is funding, in a timescale that meets the needs of the stockpile. We have worked very closely with General Kehler on what those timescales are, and we believe it is possible to meet those timescales starting now. However, I am concerned if we delay.

Senator FISCHER. I am learning about nuclear pits. Is it more affordable to have an approach where you are trying to achieve the stated requirements to produce the 50 to 80 new pits per year that I believe General Kehler has recommended? Do you have a plan for that? Are we going to be able to meet that 50 to 80?

Dr. MCMILLAN. In our current situation, without doing additional construction, we believe that we could produce up to about 30.

Senator FISCHER. Is that what we need, or do we need the 50 to 80?

Dr. MCMILLAN. If I can finish just a moment and then I will come back to that.

If we are able to put the modular approach in place and begin work on that, we believe that will get us to in excess of 50 pits per year. So that is the level.

Given the current assumptions about stockpile size and LEPs, if we are able to start the production of order, 30-a-year in the early 2020s, we can meet the requirements that STRATCOM has, but if we can get to 50, that gives us some margin in case we slip on the time. It becomes a race with time. Nature is acting.

Senator FISCHER. Are there any technical risks in moving forward at that pace?

Dr. MCMILLAN. The place where the technical risk shows up is this strategy depends on something that we have described as pit reuse. Pit reuse is something that, I think, is a credible path forward, but what that does is that moves the risk from pit production risk to risk that is associated with certification. We have begun work in the last year since I last spoke to this committee that is very encouraging in that regard. The words I used last year were "cautious optimism." Those words still stand, but there is continuing evidence to support that cautious optimism.

Senator FISCHER. From your statements last year with the cautious optimism, you are still in that same place today.

Dr. MCMILLAN. I am with additional evidence to support that.

Senator FISCHER. Thank you, sir.

Dr. Albright and Dr. Hommert, on pit reuse, the existing pits that we have in the inventory that we are thinking about using—I have been told they are between 20 and 50 years old. Is that correct?

Dr. ALBRIGHT. Yes.

Senator FISCHER. Yes. Okay.

Do you understand the factors that are involved in reusing these pits and risks that might be there?

Dr. ALBRIGHT. I think we have a pretty good understanding of the various factors involved. One of the factors that you imply had to do with the aging of plutonium over time. There has been a pret-

ty concerted effort at both Los Alamos and at Livermore over the last decade or more that has been looking at plutonium aging, and we actually have samples that we keep in our laboratory—and Los Alamos does the same—that are 40, 50, 60 years old that support the conclusions that the last decade of study has implied, which is that these pits are good for many more decades to come.

The other issues associated with reuse revolve around pits that were designed for a conventional high explosive implosion that we now want to use in an insensitive high explosive regime system. There, I think, the science is a little bit more complicated, but I think both Los Alamos and Livermore would agree that we have developed approaches that we believe are low to medium risk associated with that and, frankly, are pretty confident that we can make this work. I think the real issue there is going to be the certification process, doing the kinds of experiments that do not just convince us but, frankly, convince the Navy and the Air Force that, in fact, these things work as we predict they will.

Senator FISCHER. So you have done experiments on them.

Dr. ALBRIGHT. Some experiments have been done. In fact—let me see. I am not sure what I can say here.

Dr. MCMILLAN. If I may, we did nuclear tests back in the day of nuclear testing that used the concepts that both Livermore and Los Alamos are considering.

Dr. ALBRIGHT. Right. I was not really sure I could talk about that.

Senator FISCHER. On the older ones that are 40 to 60 years old?

Dr. ALBRIGHT. No. The plutonium experiences that were done were not that old, but what was important about those experiments is that they were pits that were designed in a conventional high explosive system and were actually being tested. They had, in fact, been certified and were about to be deployed into the stockpile, and then they just did not. They were actually going to be deployed in an insensitive high explosive environment. These are pits that are very similar to the ones that are under consideration right now.

Senator FISCHER. Thank you so much. My time is out.

Senator UDALL. Thank you, Senator Fischer.

Dr. Albright, let me continue visiting with you. I mentioned that at the NIF last year, I do not think we achieved sustain fusion, or burn as I think it is known. That milestone is important, I think, for the stockpile stewardship program. Can you explain what effect we will see because of not achieving sustained fusion when it comes to our understanding of the weapon and any other comments you might have?

Dr. ALBRIGHT. Sure. So let me actually start by pointing out that the NIF is to this day doing many experiments in support of stockpile stewardship. We actually have a demand for about over twice the number of experiments, requests that we can actually satisfy in the facility today.

The particular stewardship experiments that you are referring to have to do with thermonuclear burn. There was a requirement or a milestone that passed last year without our achieving thermonuclear burn at NIF.

The weapons issues that are associated with that have to do primarily with the uncertainties and the physics associated with what

is called boost. This is a process that occurs right at the end of an implosion of a primary and is one of the remaining physics uncertainties that we have about the operation of nuclear weapons.

In our computer codes, we have—my colleagues would call them—adjustable parameters. I call them fudge factors. We have parameters in the codes that we tune to replicate our experience with underground tests that we would prefer to actually have based on scientific fact. That allows us then to assess options for LEPs and to, frankly, just better understand the operation of a nuclear weapon if we were able to achieve fusion ignition at NIF.

I would also like to point out that the NIFs were reviewed by many external panels, the National Academy of Sciences. We had a panel that Bob Byer led who was a former president of the American Physical Society. There have been numerous NNSA reviews. Every one of them has made the point that although a perhaps more deliberate approach is needed to try to achieve ignition and more time is needed, that there are no reasons to believe that ignition cannot be achieved at the NIF.

So we continue to do experiments. Actually this more deliberate approach has been applied over the last year or so, and I can tell you it is showing very good dividends.

Senator UDALL. Thank you for that elaboration.

Let us turn to the LEP of the ICBM W78 warhead. You are the lead for that work. My understanding is that the administration is pursuing an evaluation of an interoperable warhead for the W78 and the submarine W88 warhead. I realize this is early in the concept assessment phase, but in terms of risk, how risky is this effort, say, compared to straight LEPs of the W88 and the W78 warheads?

Dr. ALBRIGHT. That is a very good question. My view is it is actually very low risk. I think all the components that are involved have been nuclear-tested in the past. There are some potential issues that are more on the engineering side having to do with both the mass properties and making sure that the nuclear explosive package that we develop can fly in both a submarine-launched ballistic missile (SLBM), as well as an ICBM. Then there are also interface issues that are more in the Sandia realm associated with interfacing with the submarine-based weapons system and the Air Force weapons systems. But these are all, I think, very doable.

Senator UDALL. Let me ask a question that I think you are ready for. Does the fiscal year 2014 budget request enable you to meet your commitments to maintaining the existing stockpile?

Dr. ALBRIGHT. I think that there are significant impacts in the fiscal year 2014 budget request. With regard to the W78/88 LEP, we believe that there is enough funding in the fiscal year 2014 budget to support some of the things the administration wants to do like an early down-select. However, there are some technology maturation issues that are not funded and are the kinds of things you want to do early in the program. You do not do technology maturation late in the program, and therefore, if you do not fund those when you need to fund them, you add risk to the program. So I think that is an issue.

I also think, as I pointed out in my opening remarks, what the laboratories do is more than just maintain the existing stockpile.

We also provide a workforce and a set of capabilities that is needed again to conduct significant finding investigations, to be able to assess issues that pop up under surveillance, and again, to provide a hedge against technological surprise and changing national security conditions. I do believe that the fiscal year 2014 budget does significant damage to some of the scientific capabilities at the laboratory in that regard.

Senator UDALL. Is it fair to say that if you are in a position where you, at best, furlough people, at worst, you are laying people off, you cannot just, if the conditions change, retrieve those people, rebuild that workforce overnight? You all operate in a unique market, if I could use that term.

Dr. ALBRIGHT. I think that is correct. When these people leave the laboratory, you lose them. They are gone forever. As I think Dr. McMillan pointed out earlier, and actually Dr. Shank made the same point. We are in a unique market that requires years of training and expertise. You do not just become a nuclear weapons designer overnight. As Dr. Hommert pointed out, you bring in young people, you pair them up with older people, and they develop that expertise over time. To do that and then to show them the door is in my view not a good policy.

Senator UDALL. Yes. I was intrigued, to put it mildly, to hear—and I think Senator Fischer may already know this—that you and the other laboratories often are competing with Google and Twitter and a lot of the new technology businesses for the kinds of minds and work ethic that you all need.

Dr. ALBRIGHT. So it is interesting. It is interesting you say that. I actually took a tour of the Twitter site about 3 weeks ago. I am in the Bay Area, and it is a different universe, I will say. We are never going to offer our people free lunches and we are never going to be able to offer a massage room, which is what they had.

But what we do offer is the ability to work with the very best in the country on a mission. The people who come to our laboratories come because they want to make a difference, and the kinds of things that we do in our laboratory make a difference. As long as they feel that they can make that difference, we can retain them. They are working with the best facilities, the NIF, Dual-Axis Radiographic Hydrodynamic Test Facility over at Los Alamos, Microsystems and Engineering Sciences Applications at Sandia, and they work with the very best people. We still remain a destination for the very best and brightest in this country. I really worry about whether we can sustain that in the current environment.

Senator UDALL. Thank you for those insights.

Senator Fischer.

Senator FISCHER. Thank you, Mr. Chairman.

If I may, I would like to get into a little more detail on the W78 and W88 and also the LEP. For the three of you gentlemen, last year I believe the committee was informed that the LEP was being delayed 2 or 3 years, and you mentioned the current status on that. I am probably doing a rhetorical question here. Do you believe that there is sufficient funding in the out-years so that you are going to keep that 2025 date for the first production unit?

Dr. HOMMERT. I can start. Let me just say for the W78/88, we are still at a very early stage. In the space for my laboratory, I feel

like the work that we are doing and executing today on the B61, the W88 Alt 370, and the Mk21 fuze, in addition to the early study that we did a feasibility study on interoperability, position us quite well to support with adequate funding, which needs to begin not for a few years yet, a date in the mid next decade. So from a Sandia perspective, I think we are in a reasonably good position to support that if these other activities are supported on the currently established schedules, and I have some concern about that. But under that assumption.

I do believe—and I will let my colleagues comment—that as a perhaps not entirely uninformed observer of their responsibilities on that effort, that we should be beginning now to take on the certification challenges associated with the nuclear explosive package because I do believe that there are risk issues there, although I have great confidence in my two sister laboratories that they can achieve that. But I believe that that is what should begin and begin soon.

Senator FISCHER. If there are limits to the funding that these other activities would receive, does that then limit the scope of your mission?

Dr. HOMMERT. Let's see. If these activities I have just outlined are not funded in the schedules that we laid out really last year in preparation for fiscal year 2013 for full scale engineering development, then you have a variety of issues that occur.

Senator FISCHER. How do you prioritize then?

Dr. HOMMERT. I think in my mind it is clear that the B61 is a high priority. It has a number of drivers. There are some technical issues, which we will not talk about in detail here, that are real drivers for that early next decade. So we really need to progress on that. The Navy has some very clear drivers also for the W88 Alt. All three have issues. There are different scope activities. The current schedules, I think, have the right priorities in terms of timing.

The concern is that if those slip significantly, you then—going back to an earlier point that the chairman made—have the possibility of stacking up a fair amount of production requirement falling on top of one another early the next decade and also just late design activities that can complicate our ability to support the W78/88. There is a sequencing and phasing here that is important to adhere to.

Dr. ALBRIGHT. I referred earlier to some of the technology maturation efforts that are needed on the W78, that if you defer these, you are adding risk in my view to the program.

The other key risk factor, I think, is whether or not we can—without going into the detail, the most likely option for the primary on the W78/88 does require the stand-up and operation of plutonium pit production capabilities at Los Alamos. So any delay by the Government—any delay in funding to get that stood up—and that really has to start now—is going to add significant schedule risks to the program.

Dr. MCMILLAN. To build on what my colleague just said, the strategy we have proposed is a proposal that is based on that schedule, the schedule of producing the pits that will be required for the W78/88. So if we are able to start, I have high confidence in the team at Los Alamos and their ability to deliver on that.

The other role that we will play at Los Alamos is a peer review role for our colleagues at Livermore. I think this is one of the values that the Nation gets from having two laboratories such as the ones we represent. So we will play that role in the W78/88 as well.

Senator FISCHER. Thank you.

It is my understanding that you are looking at a warhead that is suitable for an ICBM and also the SLBM. Correct?

How is that coming along?

Dr. HOMMERT. Let's see. Again, we did an early feasibility study, and I would say that was positive on our ability to do that. There is a lot of devil in the details in this, as our Navy and Air Force colleagues remind us frequently. There is more work to be done in a concept phase in what we call 6–2. There will, undoubtedly, be some adjustments as we go along, but in the space of arming, firing, and fuzing (AF&F) and in the support of different security features, I am confident that the modular approach that we are pioneering now, with examples like you have there, will afford us flexibility we have not had in the past. So I do believe there is much to be had here, but there is a fair amount of work that has to yet be done to determine how far and how effectively we can implement such a concept.

Dr. ALBRIGHT. Yes. I would just add one area where there was a potential risk, I think, was taken off the table when the Air Force made the decision on the reentry body that they wanted us to design to. That helped a lot.

I think in the early concept phase we identified some issues associated with what are called the mass properties of the warhead. This has to do with where the center of mass is in its various moments because the SLBM flies differently than the ICBM does, and the post-boost vehicle and the reentry body fly differently. But I think we have to the point now where we are pretty well convinced that that is very doable.

Senator FISCHER. Thank you very much.

Senator UDALL. Thank you, Senator Fischer.

Dr. Shank, let us turn to the good work you are doing. In phase I of your report last year—I think you alluded to this in your opening statement—you mentioned a lack of trust and micromanaging between the NNSA and the personnel at the weapons labs. Does the recent Y–12 break-in and claims of lack of Federal oversight give you any pause? What do you intend to do in terms of your final report as to clarifying this or further expanding on what you have viewed, what you have observed?

Dr. SHANK. Certainly Y–12 is a very different kind of an institution from the national laboratories. So it is not something we looked at and not something that our report had anything to say about.

My own personal opinion, as you look at dealing with that issue, there are serious growth issues having to do with Y–12 that to me, if the answer is to put another layer of oversight rather than fix and make more effective and make sure that the oversight is efficient and effective, I do not see a solution to the problem. I certainly would not change anything that we had in our report having to do with that. Having said that, it is not the same kind of institution as the laboratories, but that it is a matter of doing oversight

effectively, efficiently, and rather than looking at low-level details, look at the most important issue. In the case of the Y–12, what could be more important than protecting that stockpile or that material?

Senator UDALL. Let us talk about retention of scientists and engineers. Are you worried about retaining key personnel at the two physics laboratories, which of course are Los Alamos and Livermore?

Dr. SHANK. I think constant vigilance is going to be required in retaining those employees. Things are clear that currently there has been a slowdown in the market for such people. As the economy recovers, I think that is going to be more of a challenge. I think if you look at issues of working in an audit environment, working in an environment where your ability to grow as a scientist are restricted by the issues that I raised in conference travel and a lack of attention to the work environment, yes, I think there is a risk.

I think that on the up side, the kind of people that we are talking about and I heard about here with my colleagues to the right—described the kind of people they get. They are very motivated by the mission. I think that when I talk to young people in the laboratories, you can clearly see they were motivated by the mission but very concerned about what was going to happen with their career with the trends in the work environment.

Senator UDALL. Let me turn to a question and comments I am sure you would have on the capacity of the laboratories to do non-defense-related research. It has often been said that one of the great strengths of these laboratories is their capacity to apply multi-disciplinary teams to fields outside the weapons area. The human genome project is an example of this kind of work.

What are your thoughts on this potential and to what extent should we be encouraging or supporting the laboratories to continue these scientific pursuits?

Dr. SHANK. In our first report, we lauded the five-agency agreement that took advantage of the unique skills of the laboratories to work on broader national defense programs. I think all of the laboratory directors, when I have heard them speak, say that their number one mission is the nuclear weapons complex. Things that add to that support that mission. So in terms of what we have looked at and what we think the laboratories are capable of, there is an enormous amount of work that can be done of a very broad nature that in the end support that I think particularly at Sandia where they have a very large "work for others" program that, as we heard, very successfully helps them address mission needs as they arrive. I think there is a very large area in that work space where the laboratories can be useful.

Senator UDALL. Let me direct a common question to all of you. I actually have a series of them. But in stockpile stewardship, it was one of the great successes in the 1990s when we saw the development of tools and people to maintain the existing stockpile without testing. Do you believe it was and continues to be a successful program, and what do we need to do to keep it on track? I will start here and we will move across. Dr. McMillan?

Dr. MCMILLAN. Thank you, Mr. Chairman.

I have had the privilege of spending the leadership portion of my career, most of the last 20 years, working on stockpile stewardship. I believe that today the results we are seeing from stockpile stewardship exceed the expectations I, for one, had when we started nearly 20 years ago. It is an investment that the country has made, and it is an investment that is paying off handsomely in our understanding of the stockpile today. In my annual assessment of the stockpile just last year, I saw results in understanding nuclear tests that were done during the period of nuclear testing that we did not understand and that today, because of the investments the country has made in stewardship, we understand. So I believe those investments have paid off handsomely in our ability to assess the certification and to certify systems as they go in.

Dr. HOMMERT. I certainly agree with my colleague. He and I were actually together on the ground floor of this program in the middle 1990s. I also believe it has exceeded our expectations. I think it leaves the country in an enormously strong position to deal with whatever might be thrown at us because of the deeper understanding we have. For example, that component which will go into the AF&F assembly, for the Navy will be certified to radiation conditions for the first time without underground testing, as well as without certain fairly expensive-to-operate above-ground facilities with, I believe, great confidence because of the tool sets we have put in place over the last 10 years.

I also believe that we would not have the robust talent that we have just been talking about if we did not have the facilities and capabilities that stewardship put into the laboratories that has allowed us to attract the individuals that we now are using.

The last point I would say is that there is a natural transition here. We must continue to work the stewardship issues. But I also think it is fair to challenge us that we have to demonstrate the value of these investments in how we execute modernization. I believe we have begun to do that in cost management and in our ability to qualify and certify with great confidence. I believe we are well-positioned to do that.

Dr. ALBRIGHT. I think it has actually been an extraordinarily successful program. I was not part of the laboratories when this was founded, but I certainly was an observer from the sidelines. I think nobody expected it to be as successful as it has been. It is basically founded on the idea that through scientifically grounded understanding of how a nuclear weapon operates, coupled with simulations of that theory and then experiments that challenge the assumptions associated with that that we can substitute for the Cold War paradigm of constant design and nuclear tests out in the desert. So far that has worked out extraordinarily well. We have, for example, found issues with our weapons that we would not even have found out about in a nuclear test. We have actually found out about them through modeling and simulation and have been able to repair them, things that we would not have found out except through the stockpile stewardship program.

I will point out again, echo the point that this is really all about the generation of people that we are developing. I just appointed an acting director for my weapons program who came to the laboratory in 1998. That is 6 years after the last nuclear test. As we

proceed forward with the W78 and W88 and the long-range stand-off and the series of LEPs, the number of people who we are going to have attached to these programs who were ever even in their youth associated with a nuclear test is diminishing rapidly to zero. So this is really an essential program for sustaining the stockpile.

Senator UDALL. Dr. Shank, do you care to comment?

Dr. SHANK. The only comment that I can make is that the ability and the focus of the laboratories in recruiting the next generation of weapons designers and engineers and scientists has really produced remarkable results, I think that gives me a good feeling that they will be successful in the future, providing the work environment and all the other things that allow them to work at their very highest potential will be fulfilled.

Senator UDALL. Senator Fischer.

Senator FISCHER. Thank you, Mr. Chairman.

Dr. Shank, in your opening remarks, you referred to a study and you said that your views were your own when you commented on that. You said that experiments are becoming unaffordable. Is that correct?

Dr. SHANK. Correct.

Senator FISCHER. You referenced regulations and duplication and a lack of trust, and you said we are often missing the big picture. So how do you believe we can improve the NNSA then?

Dr. SHANK. That is a very good question. In my last testimony, I will describe what I had said.

First, this is public money, Federal money. It must have Federal oversight. It is absolutely essential for the trust and the ability of Congress to be able to support this work that there be oversight. However, I believe that we could do much more efficient oversight, and efficient oversight would come about rather than overseeing each detail, each action, we would put together a system much like a bank puts together a system. It does not look at any transaction but, in fact, looks at a system that is maintained by the laboratory and audits that so that there is a responsibility of the laboratories to be transparent and auditable in what they do. At the same time, this gets efficiently done in a very cost-effective way with fewer people by putting the onus on the laboratories to be able to operate in a system that has been accepted and verified and one in which it can be audited.

I spent the first 20 years of my career in private industry. If private industry did oversight of its work the way that we do at these national laboratories, it would be very difficult for them to survive financially. I think that we ought to look and realize that every time we spend money in doing something in an oversight issue which could be done more effective and efficiently, we are losing an opportunity. So I want to make very clear not just less oversight, more effective and more efficient oversight, look at things that are very important and give you an answer that you trust that the work is being done. If you look at the laboratories as untrustworthy institutions, then the kind of oversight that you are going to have is going to be one in which you want to look at every transaction. So the laboratory has to do work to raise their level of confidence and capability so they can be trusted to do this. So the core issue is trust. The long-term goal is efficiency.

Senator FISCHER. Thank you, sir.

I would ask all the lab directors then how you would describe your relationship with the NNSA, with your laboratory, and what do you believe should be the central focus of this newly created congressional advisory panel. If you would like to each take a turn at that, please.

Dr. MCMILLAN. First, let me agree with Professor Shank. I believe oversight is important for both the Government and the laboratories to ensure that we have processes and programs that can lead to trust. I continue to see growth in that area in our interactions over the last year with NNSA. I continue to believe that there is opportunity for growth. I look forward to the congressional commission that has been appointed because on that commission, I see many people with many decades of experience, and I believe there are opportunities through that commission to bring additional strength to that relationship.

Dr. HOMMERT. I clearly think this is an area that is very fundamental to our ability to continue to perform cost effectively and for the environment for our staff. I do believe that the relationship needs a fresh look. I think there may be structural issues in the way NNSA is positioned inside the Department of Energy (DOE). I believe that the panel that has been established has absolutely the right expertise to take a hard look at that. I would say, along with Dr. McMillan, I see some things that are positive. We have tried to move to a more strategic performance evaluation plan.

On the other hand, I continue to experience a very high level of detail scrutiny that makes it difficult for me, I believe, to get the focus on continuous improvement in our performance in operational aspects, whether it be safety or security. We are not perfect in these regards. We need to continuously improve. But that will not be achieved by fairly detailed compliance efforts that are not looking at overall larger improvement efforts among our workforce.

There is room for improvement here. I think that the congressional panel is well-staffed to do that. We look forward to interacting with them.

Senator FISCHER. Do you believe that if the focus is not so much on every single detail and you have a panel that you are hopeful that they are going to maybe take that broader look, will that help with your timetables on different projects?

Dr. HOMMERT. It could. It could help because——

Senator FISCHER. Also with costs then as well.

Dr. HOMMERT. Absolutely. There are some significant costs. Timetables are usually driven—I did not get a comment to talk about the 2014 budget, but budget limitations can impact timetables. If you can execute more efficiently, more cost efficiently, that relieves some of that pressure. It will allow you to hold schedule. That is important. That will not happen overnight, but I do believe there is opportunity there.

A statistic. Last year, we had 73 independent external governmental audits within the space of a year. That is one every 3½ days. You have to have a certain amount of staffing to interact at that level on any individual one. It's entirely appropriate for the Government to do, but you might expect there is a bit of duplica-

tion and there is a bit of process that is not always the most efficient use of resources. So there is some opportunity here, yes.

Senator FISCHER. On those audits, how many agencies did they come from?

Dr. HOMMERT. The majority of those are from aspects of the DOE and, of course, the GAO was involved in that. But there are different components of the DOE, whether that be what is called Office of Health, Safety, and Security or NNSA itself or the Inspector General, all appropriate organizations and again each individually an appropriate examination. But when you sit on our side of the equation, it can be a fairly significant burden and the potential for duplication is there.

Senator FISCHER. Do you keep track of the hours of work that go into these audits and itemize them by duplication?

Dr. HOMMERT. Senator, would you like to join our management staff? You are cluing in on some pretty good questions. [Laughter.]

Senator FISCHER. I look at this as common sense.

Dr. HOMMERT. Thank you.

We have looked at it in selective cases and it is significant. The cost of these things certainly runs in the millions.

Again, I want to emphasize that audits and external oversight are absolutely appropriate.

Senator FISCHER. Yes, they are.

Dr. HOMMERT. It is how you hone it and make it efficient.

Senator FISCHER. Thank you.

Dr. Albright, just a few minutes.

Dr. ALBRIGHT. Yes. I will try to keep it brief.

I think my colleagues have actually covered most of this. This is not the first study that we have done on this topic. There have been a number of studies over the last 5 or 6 years. They all pretty much have come to the same diagnosis and maybe some slight differences in what the cure might be.

I think you have assembled an incredibly talented panel of people who have a deep insight and history into NNSA and the governance process. So I am looking very much forward to what they come up with.

A couple of observations. One is—and Dr. Hommert alluded to this—you do not have, in my view, a clear set of roles, responsibilities, authorities, and accountabilities on the Government side. So you have NNSA headquarters. It has its beliefs about what its roles and responsibilities are. You have DOE headquarters. You have what is formerly known as the Albuquerque Service Center. You have the site offices. I have 100 people at my site office. You have about the same. Even within the site offices, you have contracting officers and then you have the site office manager, and they do not always agree and they are all setting policy.

So getting that clarified and, furthermore, getting it focused on—as you make policies on oversight, you have to make that cost-benefit trade that Dr. Shank referred to in terms of how it impacts the mission. The easiest thing you could do, if you wanted no safety or security issues, is to just put a big brick wall up around the laboratories and not let anybody in. That will take it down to zero. So there is a cost-benefit calculus.

Then, frankly, I think the other thing that Dr. Shank alluded to is we have to have clear roles, responsibilities, authorities, and accountabilities between the Government and the laboratory management. We have at our laboratories a view as to what our responsibilities are for managing the laboratory in terms of our human resources policies, our business practices, our safety and security. The problem in part is that we also have about 1,000 people in the Government who also think they have those same roles and responsibilities and authorities and accountabilities. That is how you get into this transactional oversight regime and where we are in a position then of having large numbers of people on our staff there to feed the beast without any real value added.

So I really look forward to this commission and seeing what they come up with.

Senator FISCHER. Thank you.

Thank you, Mr. Chair.

Senator UDALL. Thank you, Senator Fischer.

I have one more question. We are counting down to the 4 o'clock timeframe which we were going to attempt to end the hearing. This has been very valuable.

I know we were talking about this question I am going to ask you. So take that into account. The 2010 posture review mandating the NNSA to undertake a wide range of LEPs, as well as replacing unique and costly facilities. The problem that I think we face in Congress is the poor track record of the NNSA when it comes to maintaining cost, scope, and schedule from prior projects. If there is a single issue that you think stands out leading to this poor track record, what would you identify that to be?

Dr. McMillan, I do not know if you want to wade in first, but we will ask you to do so.

Dr. MCMILLAN. The one-word answer would be: stability. If we can have stability that gives us the predictive ability to do things, then we can move forward. If it is constantly changing, it makes it almost impossible for us to do what we would like to do, as well as I know you would like to do.

Senator UDALL. Thank you.

Dr. HOMMERT. I would echo that. I will give you as an example the B61. We laid out what we call a weapon development cost report in June 2012. It laid out a 12-year program. We believe that if we want to execute that program on schedule, on cost, then adhering to that plan is the most effective way to do that. When we have either changes in requirements or even, I think, going back to our previous topic where we do not have the most effective partnership working between the laboratories and the NNSA, all of that can lead to uncertainty, can lead to changes that have the net result of adding cost, adding delays into performance. So these are areas I think we have to really focus on.

I believe we have in front of us, across all of the topics we have touched on today, some sound plans. We just now, I think, need to focus on executing those plans, minimizing changes to requirements, minimizing uncertainties in, quite frankly, the funding profiles that we need to execute them.

Dr. ALBRIGHT. Yes, I would echo all of that.

I think you also should not lose sight of some of the successes that have occurred within the nuclear weapons complex when we do have that kind of stability. One example I would point to is in high performance computing. We have had a longer than a decade record of delivery, partnership with industry, and delivery of capability that, frankly, exceeds anything anybody would have expected on cost, on schedule. I think that is in large part due to the fact that we had a good partnership with the Government in how we executed that part of the program. We had stability in the requirements. We all knew where we were trying to go and we were allowed to do that.

Senator UDALL. Fair enough. It is important to acknowledge those successes.

Dr. Shank, you have the last word here.

Dr. SHANK. I think the laboratories have tremendous potential. I hope that we can get a focus and help fix some of those issues that allow them to be better managed. But I think you have great people and I have great confidence they are going to deliver on their mission.

Senator UDALL. I think, again, I heard you say the core issue is trust. If we are able to generate some additional efficiency, we will build trust. Is that an accurate way of——

Dr. SHANK. Trust and performance.

Senator UDALL. Performance. Thank you for that.

Senator Fischer, do you have other questions?

Senator FISCHER. I just have a couple quick ones here. Dr. Hommert wants to talk about the budget. Last year, you expressed some concern about the impact of funding shortfalls on these different programs, especially over the next 5 to 10 years. You said we run a huge risk in our ability to continue to do stockpile assessments and to conduct future LEPs.

So given that we now have some 34 percent or that we are some 34 percent short in that funding increase, that $1.4 billion shortfall, that was promised in November 2010, is your concern now greater than it was last year?

Dr. HOMMERT. I would answer it this way. I think from where we were last year—an example I gave is the B61. We have now gone through a very elaborate, detailed process of estimating the cost to execute that program and we have shared that with the Government. They have put it together across the entire enterprise.

My concern is that our ability to hold to that schedule requires that the funding in the key years—in the case of the B61, 2014, 2015, 2016—be consistent with that plan. From what I can tell now as a result of sequestration in 2013 and what we see in the 2014 budget, we are going to slip off of that plan not dramatically but slip enough that in my view we will see schedule impact. Schedule impact will lead to cost growth. So I do have some concern.

Furthermore, when that happens, you begin to pressurize the entire program and it puts more pressure on our ability to do the adequate surveillance that we need to do, et cetera.

So I think we need to pay close attention to this going forward. These schedules are visible. They have cost impacts. They are,

right now, I think, under some pressure. So my sentiment remains the same as last year.

Senator FISCHER. My last question for you then, sir, as a Nebraskan who has been to STRATCOM and understands the importance of STRATCOM, you are the only one of the three laboratory directors who testified during the New START hearings. Do you think we have lived up to our modernization commitments?

Dr. HOMMERT. Let's see. I would say very positively that the challenge that we faced in 2010 to transfer the policy level NPR direction, which is what we testified or basically spoke to in 2010, into executable plans—there has been great progress made on that. Now our challenge is collectively between the administration and Congress to fund those executable plans. That is a challenge in this fiscal environment. We understand that, and so we will have to see how we trod through that.

So on the one hand, I am encouraged that we have made the right kind of progress from policy to plans. Now my concern is can we execute them. That challenge sits in front of us. When we are funded, as that little component indicates, these institutions will execute without question.

Senator FISCHER. You do remarkable work, all of you, and I thank you for being here today.

Senator UDALL. Dr. Hommert, I assume you want this wonderful mechanism back. [Laughter.]

Dr. HOMMERT. I do actually, yes.

Senator UDALL. It is a work of art. We appreciate it, because I know Senator Fischer and I are both visual learners, your bringing a—it is not a prop. It is an aid and it is also an example——

Dr. HOMMERT. It is going to fly in a development unit in a couple of months, so it will be in the air.

Senator UDALL. That is what we do the best, which is innovate. It is how we are going to continue to see our economy grow and prosper.

Let me just, again, thank you for your expertise, for your time, for the very thoughtful testimony. I know you—I think Senator Fischer would join me in acknowledging this—pursue your mission because it is important, because you believe in it. But I also want to acknowledge, on the part of this subcommittee and the Senate Armed Services Committee (SASC) at large and America at large, the great important work you do, that you are unheralded. This is a dangerous world. I know we believe at some point we will have peace broadly distributed around our planet, but until we do, we have to be strong and through that strength comes peace. So thank you.

We will keep the record open for questions—that is directed at our colleagues—until close of business on Thursday.

We do have a markup we are going to conduct as soon as the SASC moves forward to the National Defense Authorization Act introduction. A busy week for—I think this is the most important subcommittee in the whole Senate—the Strategic Forces Subcommittee. We have a hearing tomorrow with NNSA on environmental remediation. GAO, I think, is going to join us. Then we have another hearing on Thursday.

So with that, the Subcommittee on Strategic Forces is adjourned.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR DEB FISCHER

FUNDING SHORTFALLS AND THE FUTURE OF THE NUCLEAR WEAPONS ENTERPRISE

1. Senator FISCHER. Dr. Albright, Dr. McMillan, and Dr. Hommert, given that we are now some 34 percent short of the funding increase promised in November 2010, are reducing investments in key facilities like the National Ignition Facility (NIF), and have deferred a major infrastructure project, do you believe we're following through with our commitment to modernize our nuclear complex?

Dr. ALBRIGHT. The President's Nuclear Posture Review (NPR) noted that a key enabler of stockpile reductions is a modern and capable nuclear weapons enterprise. Hence, sustaining progress on stockpile stewardship priorities at a time of budget austerity is a significant concern.

Because weapons in the stockpile continue to age beyond their intended service life, timely execution of planned life extension programs (LEP) is vitally important, with the objective of implementing over time the Nuclear Weapons Council's 3+2 vision for the future stockpile. Concurrently, we need to invest in the enabling infrastructure of the National Nuclear Security Administration (NNSA) enterprise. A robust production capability is crucial to the 3+2 vision and also to the Nation's deterrence posture. It is comparably important to sustain the people and tools (such as NIF) that provide the science, technology, and engineering foundation of the nuclear enterprise.

At the Lawrence Livermore National Laboratory (LLNL), we recognize that work on LEPs is job #1 for NNSA, although funding constraints are pushing out completion of planned LEPs about as far as is acceptable. At the same time, LEPs are not the only job, and sustaining the enterprise entails more than sustaining the weapons themselves. A healthy enterprise is a crucial component of the Nation's strategic hedge against technological surprise or changing world conditions.

I expressed particular concern in my testimony about the drastic reductions in the budget for the NIF at a time when the demand for shots from the Stockpile Stewardship Program (SSP) and other NIF user communities far exceeds available shot time. NIF has achieved full steam operations in the past year. To cut back operations at the scale proposed; delay by years the acquisition of important scientific data associated with the processes that occur within nuclear weapons; disrupt the world-class team supporting facility operations, experiment design, and data analysis; and deplete the NIF user community so soon after completion of the facility, after decades of effort, would not only damage the Nation's national security and scientific credibility, but also lead to a loss of U.S. leadership in this important field.

Dr. MCMILLAN. We fully understand the fiscal environment facing the government and the difficulty this poses to building two multi-billion dollar nuclear facilities while also undertaking several LEPs. Because the deferral of Chemistry and Metallurgy Research Replacement Nuclear Facility (CMRR–NF) pushed likely completion into the late 2020s, I challenged our team to examine the requirements to try to find ways to more effectively modernize the infrastructure. One positive example of that is the emerging plutonium strategy where we have developed an effective approach to obtaining the needed plutonium infrastructure for the Nation in a manner that uses what we already have to the maximum extent and relies on new facilities, in part, to avoid a very costly early replacement of our only full-service plutonium processing facility. This approach will also allow us to have the benefit of bringing capabilities on-line as needed versus waiting until an entire facility is complete before being able to use any capability.

Dr. HOMMERT. The fiscal year 2014 budget request continues to address the recapitalization program for our silicon fabrication facility. Funding in fiscal year 2013 enabled us to replace the single most expensive and highest-risk item in the facility. The fiscal year 2014 budget request continues the recapitalization program at the planned level, but I would note that for program completion, commitment to multi-year funding is required.

One of Sandia's critical dual national security missions for the U.S. nuclear weapons program, as well as for the Department of Energy's (DOE) nonproliferation payloads, is our microelectronics research and fabrication facility, where we design and fabricate an array of unique microelectronics, specialty optical components, and microelectromechanical system devices. Recapitalization of this capability will reduce the risk for delivering the B61 LEP and ensure production of the radiation-hardened components required by the W88 Alt 370 and all future reentry system LEPs.

As we go forward on stockpile modernization programs, our microelectronics fabrication facilities, which form the basis of our trusted foundry, will be critical to ensuring the integrity of our supply chain.

We have significant recapitalization needs at various experimental and test facilities critical to B61 LEP, W88 Alt 370, and future LEP success, particularly at the Tonopah Test Range in Nevada. The fiscal year 2014 budget request supports our ability to reduce risk to the modernization program through investments in those capabilities as well.

In addition to these fabrication, 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 continue to prove to be indispensable to our broader national security work. Fiscal year 2013 funding designated as the Test Capabilities Revitalization Phase 2 enabled us to finish renovating our suite of mechanical environment test facilities, which are essential to supporting the design and qualification of the B61 and other LEPs.

I want to emphasize that the investments in our stewardship tools over the past 15 years enable cost reductions in our modernization efforts through increased use of computational simulation, which reduces the amount of qualification testing; allows, for the first time, confident qualification of some components without either nuclear testing or expensive aboveground facilities; and affords important insights into the challenge of predictive aging for our older stockpile.

PLUTONIUM STRATEGY

2. Senator FISCHER. Dr. Albright, Dr. McMillan, and Dr. Hommert, the effectiveness of our pit production strategy assumes that the planned LEPs proceed on schedule. If schedules begin to slip and overlap, our requirements for new pits may increase in a given year. How will the current plans cope with additional demand?

Dr. ALBRIGHT. The long-term vision is a 3+2 composition of the nuclear stockpile—with three different, yet interoperable, nuclear explosive packages for strategic reentry systems and two different, yet interoperable, nuclear explosive packages for air delivered systems. The three different interoperable nuclear explosive packages for the reentry systems are often referred to as IW1, IW2, and IW3. Currently, IW1 is planned to be based on remanufactured pits, IW2 based on reuse pits, and IW3 remanufactured pits. The two near-term LEPs in support of the air delivered systems, B61–12 and the air-launched cruise missile replacement, are both based on pit reuse.

This choice of the phasing of pit remanufacturing, then pit reuse, then pit remanufacturing for the IWs was identified to provide risk mitigation against schedule slip of a given IW, and, therefore, limit the risk of impacts on, or requirements for increased, pit production capacity.

Dr. MCMILLAN. The current plan for LEPs relies on a combination of reused pits and new pits. Should the schedules change, we will evaluate the need for changes in pit production rates. Short of planning for a much higher production rate that might not ultimately be required, we believe that, if funded, our plutonium strategy will provide some flexibility in our ability to accommodate changing requirements. If the requirement is known, we have the ability to build pits ahead of needed schedules as one mechanism to mitigate the issue.

Dr. HOMMERT. Sandia National Labs is the nonnuclear design agency in the NNSA complex. Sandia defers comments on pit production and schedules to Los Alamos and Lawrence Livermore National Laboratories.

3. Senator FISCHER. Dr. McMillan, how confident are you that factors behind the cost increase for the CMRR–NF—whether related to governance, safety requirements, design creep, and so forth—won't have the same impact on the new modular approach?

Dr. MCMILLAN. As I said in my testimony, any nuclear construction project will have many of the same pressures that affected the CMRR–NF and all the other large nuclear facilities that were planned in the last 30 years. We believe that our three-part strategy of more effective use of the newly completed radiological laboratory (RLUOB), repurposing of our current plutonium processing facility PF–4, and targeted new small laboratory modules that are attached to the PF–4 system of facilities has the best chance of success. This strategy will give us pit production flexibility as well as meet the actinide science needs to continue to build our knowledge on new and aged plutonium.

One potential advantage of the approach should be that many of the issues that could negatively affect a new facility project scale with the size of the facility. In

addition, a couple of other significant advantages of undertaking a modular approach would be the ability design a smaller facility in a way that would be replicable which should lower costs for any subsequent facility, and ability to set distinct mission requirements that would not attempt to be everything for everyone. In addition, it is our belief that each module would require a smaller annual budget profile, which could give it more flexibility should the funding allocation fluctuate from year to year.

LABORATORY GOVERNANCE

4. Senator FISCHER. Dr. Albright, Dr. McMillan, and Dr. Hommert, how would you describe the relationship between the NNSA and your lab?

Dr. ALBRIGHT. There has been a breakdown in trust between the federally-funded research and development center (FFRDC) partners and the government. This lack of trust—highlighted last year by the National Academy of Sciences in a review they conducted—should concern us all. FFRDCs, such as the national labs, ensure that the work of DOE gets done. We do the mission planning and execution, provide corporate memory, and comprise the dedicated and professional workforce that is the enduring backbone of the enterprise. The FFRDCs are not simply contractors but rather are partners (and have been without interruption for decades) to the government. This difference is well understood within agencies such as the Department of Defense (DOD) and National Aeronautics and Space Administration, which treat their FFRDCs as trusted mission partners, which is distinctly different from how they work with their industrial base. The relationships are enduring and not limited by the duration of a particular contract.

However, within DOE/NNSA, the FFRDC construct that has served the Nation so well for decades has been stood on its head. In principle, the FFRDC concept distributes responsibility and accountability to the contractor for serving the sponsor's (in this case NNSA's) mission with excellence, in a secure and safe manner, and consistent with State, local, and Federal laws and regulations. Hence, the need for equivalent responsibilities and accountabilities on the government side is largely obviated. That is, under this construct, the role of the government is limited: manage the contract consistent with Federal Acquisition Regulations (FARs) and DOE Acquisition Regulations (DEARs) to ensure performance objectives are met; set standards (e.g., require compliance with the International Organization for Standardization or other international standards); advocate for the mission within the government; develop, implement, and rationalize a budget; make capital investments; and take those actions needed to assure the excellence and sustainability within existent policy and budgetary constraints.

Under this construct the FFRDC is held accountable, and the government is expected to hold regular financial and performance audits and reviews. If there are too many security or safety incidents, the employees concerned are disciplined or let go, and/or the institution is fined. If concerns arise regarding the mission performance of a particular institution, or if it appears to have systemic issues, the government can demand that the FFRDC change leadership or in extreme cases, the government can recompete the management and operations contract. This philosophy guides how DOD works with its FFRDCs, which is demonstrated in part by the fact that the DOD FFRDCs and University Affiliated Research Centers are overseen by many fewer government employees (more than an order of magnitude difference compared to DOE/NNSA), and with very few additional specific rules and regulations.

What has instead happened within DOE is that while the FFRDCs have the responsibilities and accountabilities noted above, many in DOE/NNSA also think they have such responsibilities and accountabilities. Our contract provides that we must meet standards for safety and security, but we are also told prescriptively how we should do so. Orders and directives are substituted for perfectly applicable international standards, laws, and regulations. In all too many cases, we are told who we can hire, what we can pay them, and how we should manage our workforce. We are at times even told what experiments should be done. This is a costly, cumbersome, and inefficient governance model. As new governance structures for the laboratories are examined, they should be tested against the consequent mix of roles, responsibilities, authorities, and accountabilities between the FFRDC and the government.

Dr. MCMILLAN. At some levels within NNSA, I would describe our relationship as significantly improved. However, in other parts of NNSA, I would describe the relationship as strained with limited trust from both sides of the relationship. I

would go as far as saying that some parts of NNSA want the laboratory to just do exactly what we are told—hardly the FFRDC model.

Dr. HOMMERT. The government-owned/contractor-operated model is fundamental to Sandia's ability to continue to perform cost effectively and for the environment for our staff. As with any government and contractor management program, I do believe that the relationship needs a fresh look.

Sandia National Laboratories and NNSA are pursuing a more strategic performance evaluation plan of our mission. This new direction moves away from the micro-level milestones that require time and money consuming status updates to broader goals that demand Sandia meet NNSA schedules while still maintaining appropriate oversight.

Sandia and the other labs continue to experience a very high level of detail scrutiny that makes to focus on continuous improvement in our performance in operational aspects, whether it is safety or security. We are not perfect in these regards. We need to continuously improve. But that will not be achieved by fairly detailed compliance efforts that are not looking at overall larger improvement efforts among our workforce.

5. Senator FISCHER. Dr. Albright, Dr. McMillan, and Dr. Hommert, what do you believe should be the central focus of, or the key challenges examined by, the newly created Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise?

Dr. ALBRIGHT. Respectfully, I believe the panel should focus on offering recommendations to:

- Establish a governance model that will reestablish a trusted partnership between FFRDCs and the government in the execution of a shared national security mission with less intrusive oversight and clearly defined roles and responsibilities between the FFRDCs and the government.
- Establish a robust planning, programming, and budgeting system integrated over NNSA's portfolio of programs.
- Simplify and streamline the rules, regulations, and policies to minimize or eliminate duplicative and conflicting rules, regulations, and policies governing the conduct of operations at the laboratories and production plants.
- Establish a system to apply cost-benefit analysis to consideration of rules, regulations, and policies.
- Streamline authority within DOE and NNSA to ensure a single determining voice on policies regarding safety, security, legal, and business.

Dr. MCMILLAN. I believe that one of the key challenges that needs to be examined is the role of NNSA in determining the technical activities necessary to execute the mission. I believe that the historical role of the laboratories as trusted advisors is being eroded, which has created very strained relationships with NNSA and made it more difficult to effectively execute the mission given limited funding.

Dr. HOMMERT. The effectiveness of the somewhat unique government-owned/contractor-operated model employed by DOE and NNSA to manage the laboratories as FFRDCs has eroded under the current DOE–NNSA governance arrangement. We look forward to engaging with the Congressional Advisory Panel on this topic. Based on its exceptional members and expansive charter, I am confident that the panel will bring the careful, comprehensive examination needed by this complex but very important topic.

[Whereupon, at 4:04 p.m., the subcommittee adjourned.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 2014 AND THE FUTURE YEARS DEFENSE PROGRAM

WEDNESDAY, MAY 8, 2013

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

STRATEGIC FORCES PROGRAMS OF THE NATIONAL NUCLEAR SECURITY ADMINISTRATION AND THE DEPARTMENT OF ENERGY'S OFFICE OF ENVIRONMENTAL MANAGEMENT

The subcommittee met, pursuant to notice, at 2:45 p.m. in room SR–232A, Russell Senate Office Building, Senator Mark Udall (chairman of the subcommittee) presiding.

Committee members present: Senators Udall, Donnelly, and King.

Majority staff member present: Jonathan S. Epstein, counsel.

Minority staff member present: Robert M. Soofer, professional staff member.

Staff assistants present: Lauren M. Gillis.

Committee members' assistants present: Casey Howard, assistant to Senator Udall; Marta McLellan Ross, assistant to Senator Donnelly; and Lenwood Landrum, assistant to Senator Sessions.

OPENING STATEMENT OF SENATOR MARK UDALL, CHAIRMAN

Senator UDALL. Good afternoon. The Subcommittee on Strategic Forces will come to order.

This afternoon we will receive testimony from the National Nuclear Security Administration (NNSA) regarding their fiscal year 2014 budget request. We will also hear from the Department of Energy's (DOE) Office of Environmental Management (OEM) and the Government Accountability Office (GAO).

As I just did earlier, I want to thank all of the witnesses for taking time out of your busy schedules to appear today. I hope this hearing will be informative not only for the Senators in attendance today but to you all in understanding our views on different aspects of your programs.

I mentioned to all of our witnesses that it is a busy day on the Hill. I anticipate a Senator to drop by, but that is no indication of the importance that we all hold in the work that you do.

We have two panels today. The first panel will feature the Acting Administrator of the NNSA, Ms. Neile L. Miller. For the second panel, we will have Dr. Don L. Cook, the Deputy Administrator for Defense Programs at DOE; Admiral John M. Richardson, USN, the Deputy Administrator for Naval Reactors at DOE; Mr. David G. Huizenga, the Senior Advisor for Environmental Management (EM) at DOE; and Mr. David C. Trimble, Director for Natural Resources and Environment at the GAO.

In terms of logistics, I thought we could give Ms. Miller a half hour to about 3:15 p.m. Now, let us see. We are going to adjust that, but about a half hour. Then the second panel will have 45 minutes to an hour. This should have us finishing up 3:45 p.m. to 4 p.m. We want to make sure people have time to really explore the topics today.

With that, let me make a few opening remarks.

For the fiscal year 2014, the budget request for the NNSA is $7.868 billion, which is an increase of 4.1 percent relative to fiscal year 2012. Accounting for shifts in budget categories, the request is about 2.7 percent below the section 1251 report number of $8.4 billion. While reductions are notable, they are less than other programs are facing in our current budget climate, especially with sequestration being in effect.

For the Naval Reactors program, the fiscal year 2014 budget is $1.246 billion, which is an increase of 15.1 percent. That increase is mainly for refueling a test and training reactor and construction of a spent fuel handling facility, both of which are important to the Department of Defense (DOD) fleet operations.

The OEM request is $5.62 billion, down 1.2 percent from fiscal year 2012. Not accounted for at the present time is how fiscal year 2013 reductions due to sequestration will affect these programs in fiscal year 2014 and beyond. I understand the NNSA will lose about $600 million. The EM program will lose about $420 million, and assuming a similar cut of 8 percent, that would yield a reduction for naval reactors of about $87 million.

There are several issues I would like to explore in this hearing.

First, I would like to know from both panels what effects sequestration will have on programs already underway, whether in terms of delays in achieving milestones or in the ability to affect out-year schedules. It seems clear that the effects of sequestration will compound themselves in the out-years in ways that will increase time and cost.

Second, I would like to know from Administrator Miller what steps she is taking to control the costs of the B61 program and other life extension programs (LEP). I understand that Director Miller is working with the DOD Cost Analysis and Program Evaluation (CAPE) Office, but if we are living with two estimates, one by NNSA and one by CAPE, we will need to know which one Congress should rely on.

Third, I would like to understand from Mr. Huizenga what is being done to keep a bad situation from getting worse with the Waste Treatment Plant, especially regarding the ability to empty leaking tanks and begin treating at a minimum low-level waste from those tanks. We have a special commitment to all the commu-

nities where the DOE is cleaning up former defense sites and we need to keep it.

Fourth, as always, I would like to hear from GAO on their observations about what could be improved with existing projects at NNSA and the OEM. The NNSA has shelved two major construction projects. The Chemistry and Metallurgy Research Replacement (CMRR) project was stopped when it was 70 percent complete. $450 million had already been spent. The Pit Disassembly and Conversion project was also stopped after spending $400 million. Combined, that is close to $1 billion.

Obviously, the Waste Treatment Plant is another category, but I suspect there are common problems underlying all three projects that the GAO can give recommendations on. My hope is that those recommendations will provide lessons learned before embarking on some of the LEPs over the next 5 years.

Again, let me thank everybody for coming. I see we have been joined by my colleague from the wonderful State of Indiana, the Hoosier State, Senator Donnelly. Senator Donnelly, if you have any opening remarks you would like to make, the floor is yours.

Senator DONNELLY. No, thank you, Mr. Chairman. I am looking forward to the testimony.

Senator UDALL. Great. Thank you for being here.

Administrator Miller, the floor is yours. We look forward to your comments.

STATEMENT OF MS. NEILE L. MILLER, ACTING ADMINISTRATOR, NATIONAL NUCLEAR SECURITY ADMINISTRATION, DEPARTMENT OF ENERGY

Ms. MILLER. Thank you, Chairman Udall and distinguished members of the subcommittee. Thank you for having me here today to discuss the President's fiscal year 2014 budget request for the DOE's NNSA.

Your ongoing support for the women and men of NNSA and the work that they do and your bipartisan leadership on some of the most challenging national security issues of our time has helped keep the American people safe, helped protect our allies, and enhanced global security.

The President's $11.7 billion fiscal year 2014 budget for NNSA allows us to continue to implement his nuclear security agenda. We are also deeply engaged in efforts to realize President Obama's vision for a world without nuclear weapons, free from the threat of nuclear terrorism and united in our approach towards shared nuclear security goals.

Most recently in his 2013 State of the Union Address, the President continued to highlight the importance of his nuclear strategy and pledged to "engage Russia to seek further reductions in our nuclear arsenals, and continue leading the global effort to secure nuclear materials that could fall into the wrong hands because our ability to influence others depends on our willingness to lead and meet our obligations."

His budget for fiscal year 2014 reaffirms the President's strong support for our nuclear security missions and provides us with the resources we need to further this work.

I want to assure you that the NNSA is being thoughtful, pragmatic, and efficient in how we achieve the Nation's nuclear security objectives and shape the future of nuclear security. As someone with many years of Federal Government experience at the nexus of programs and budget, I can tell you that while we are challenged to be successful in a time of fiscal austerity and budget uncertainty, we are also dedicating ourselves to driving efficiencies into our programs so that we can make the best use of taxpayers' dollars with which we are entrusted. We are holding everyone from our contractors to our Federal employees accountable. Above all, we are challenging ourselves to reject ways of doing business that are holding us back from this but which have survived long into the post-Cold War era simply because they are "the way we have always done it."

The need to strategically modernize our facilities, infrastructure, and weapons systems is urgent, but so is the need to modernize how we do what we do. We must and we are evaluating our programs and challenging the assumptions for all of our programs and projects to rethink their underlying premises and ensure that we are charting a path to the future that is well-reasoned, responsible, and reflects the best way of doing business today.

As the President has committed, the NNSA is working to make sure that we have the infrastructure, weapons systems, and the supporting science to certify the Nation's nuclear weapons stockpile that it needs through strategic modernization investments. We are working to implement the most ambitious nuclear nonproliferation agenda in the world.

Whether or not we were facing this moment's budget uncertainties and fiscal constraints, we have a responsibility to prioritize what we do and to do it in a way that makes sense not only to us but to you, to our partners at DOD, our international partners, and above all, to the American taxpayers.

To that end, we are working very hard to guarantee our ability to deliver the mission, something my colleagues throughout the nuclear security enterprise have consistently done for the Nation over the past 60-plus years. But we know that we have to be smarter, more unified, and more diverse both within NNSA but also more broadly within the larger deterrence and nuclear security community. If we all want to see the nuclear security agenda move forward—and it is my responsibility to ensure that it does—then we need to make certain that we are able to maintain essential enabling capabilities, including for plutonium and uranium, infrastructure to support the nuclear Navy, and strong national laboratories that are the backbone of the national security enterprise. We must continue to chart the path of nuclear security together.

I have personally witnessed the evolution of these programs for many years from my positions both within the NNSA, as well as from other perspectives within the U.S. Government. The enduring partnerships between NNSA and DOD, between Congress and the administration, and between our own sites and headquarters are vital to getting the mission accomplished and maintaining the security of the Nation. NNSA cannot survive without them, and the United States nuclear deterrent depends on them.

Regardless of what organizational chart or where NNSA is aligned within the U.S. Government, we cannot do anything without the right people and the right processes in place. We are continuously seeking new solutions to improve the way we conduct business. To that end, I want to tell you about a few changes in the way we are doing what we do.

First, we reinforced our project management organization and performance through the establishment of an independent acquisition and project management group so that we could better drive performance and accountability in our construction projects. We were fortunate to be able to hire Mr. Bob Raines to head this new group. Bob, who has 25 years of experience at DOD's naval facilities organization and several years reviewing DOE projects, has brought a new clarity and accountability to the way we approach acquisition across NNSA.

We have aggressively sought physical security improvements through the reform of how we promulgate security policy and assess performance at our sites. Mr. Steve Asher has come on board to act as our new Chief of Defense Nuclear Security. He is a retired Air Force colonel with 33 years of on-the-ground nuclear security experience with the U.S. Air Force.

We have also worked to improve how we plan and analyze our budget resources to ensure that we have what we need. I believe strongly that resource decisions should be transparent and analytically sound, driven by data as well as preference. By hiring Dr. Steven Ho and standing up our new Office of Program Review and Analysis, based on the approach taken by DOD to prioritize needs, the Administrator will have an independent broker helping manage the budget process and independent analysis for NNSA programs on cross-cutting issues. Steve comes to us from the DOD CAPE where for the past year he led the cost study of the B61 LEP.

Perhaps most significantly, we have realigned the Federal oversight of roles, responsibilities, and reporting of all of our sites and unified them in partnership in a line NNSA organization reporting to the Associate Administrator for Infrastructure and Operations, who is also my Deputy, Mr. Michael Lempke. We are ensuring that we have the right people using the right processes in the right ways across the NNSA. Mission and mission-support teams are equal, supporting each other's needs on everything from regulatory issues to contracting. You saw it with our Future Shaping Nuclear Production Office, which covers Pantex and Y–12 without regard for geography. You can see it in our strong, unprecedented response to security lapses, and you can see it in our plutonium strategy where creative thinking across our enterprise has given us a path forward in a time of tight budgets. We are doing the work the American people need us to do, and the President's budget will allow us to continue to do that work. We at NNSA are working hard to align ourselves for the future, and your continuing support has been a vital part of that.

I again thank you for having me here today. I look forward to answering your questions.

[The prepared statement of Ms. Miller follows:]

PREPARED STATEMENT BY MS. NEILE L. MILLER

INTRODUCTION

Chairman Udall, Ranking Member Sessions, and distinguished members of the subcommittee, thank you for having me here to discuss the President's fiscal year 2014 budget request for the Department of Energy's National Nuclear Security Administration (NNSA). Your ongoing support for the men and women of NNSA and the work they do, and your bipartisan leadership on some of the most challenging national security issues of our time, has helped keep the American people safe, helped protect our allies, and enhanced global security.

The NNSA supports the President's nuclear security strategy, including those identified in the President's new global military strategy released in January 2012, the New Strategic Arms Reduction Treaty (New START) signed in 2010, and the Nuclear Posture Review (NPR). In April 2009 in Prague, President Obama shared his vision for a world without nuclear weapons, free from the threat of nuclear terrorism, and united in our approach toward shared nuclear security goals.

Most recently, in his 2013 State of the Union address, the President continued to highlight the importance of his nuclear strategy and pledged to "engage Russia to seek further reductions in our nuclear arsenals, and continue leading the global effort to secure nuclear materials that could fall into the wrong hands—because our ability to influence others depends on our willingness to lead and meet our obligations."

The President's fiscal year 2014 request for NNSA is $11.65 billion, an increase of $186 million, or 1.6 percent, over the fiscal year 2013 Continuing Resolution level and $650 million, or 5.9 percent, over the fiscal year 2012 appropriation at a time of sequestration and spending reductions across the government. The request reaffirms the commitment of the President to his nuclear security vision, applying world-class science that addresses our Nation's greatest nuclear security challenges and building NNSA's 21st century nuclear security enterprise through key investments in our people, programs, and infrastructure.

I want to assure you that NNSA is being thoughtful, pragmatic, and efficient in how we achieve the Nation's nuclear security objectives and shape the future of nuclear security. We are looking forward to what NNSA will become 5, 10, 20 years into the future and what we are doing now to get there.

Our missions are clear: to enhance global security through nuclear deterrence, to reduce global danger from nuclear weapons, nonproliferation, naval nuclear propulsion, and national leadership in science, technology, and engineering. Based on these critical mission and capabilities, the demand on the enterprise is growing. We are challenging ourselves to reject old ideas that represent the way things have been done in the past. We are moving beyond the Cold War, strategically modernizing facilities and weapons systems, ensuring that the United States has the critical capabilities it needs without wasteful spending. Given our budget constraints and ongoing uncertainty, we have a responsibility to prioritize how we get things done, and we have developed clear strategies to guarantee our ability to do so. We must evaluate our programs and challenge the assumptions for all of our programs and projects to rethink the underlying premise and ensure that we are charting a path to the future that is well-reasoned and responsible. We are at a particular point in time, unique for a lot of reasons, and the context matters. It was with this in mind that we made sure this year's budget request was also the result of an unprecedented level of planning and cooperation between the NNSA and the Department of Defense (DOD).

The NNSA has also made a number of organizational changes to help us make better, smarter, and more efficient decisions on how we conduct our operations and identify the resources needed to meet our nuclear strategy.

One of the major actions NNSA took in fiscal year 2013 was standing up the Office of Infrastructure and Operations (NA–00) to serve as the fulcrum of the NNSA. The office encompasses our field operations, which are now directly reporting to the Administrator through the Associate Administrator for Infrastructure and Operations, who is dual-hatted as the NNSA Associate Principal Deputy Administrator. The consolidated office serves to oversee and direct the NNSA's Operations and Infrastructure, which spans eight sites—from nuclear weapons laboratories to production plants—across seven States. The new office will make management of the nuclear security enterprise more efficient and effective.

In addition, the recently established Office of Acquisition and Project Management (NA–APM) continues to integrate our acquisition and project management staffs in order to improve the way we manage and execute major construction projects once the design is sufficiently mature to baseline and begin construction,

post phase Critical Decision-2 (CD–2). NA–APM combines its knowledge of contracting and project management to ensure identified and agreed upon needs of the NNSA are met in an effective and efficient manner. Federal Project Directors (FPD) responsible for project delivery have been re-assigned to NA–APM, and we are establishing Project Management Offices staffed with people possessing appropriate construction project management skills that will report directly to the FPDs. Lastly, the NNSA is better aligning contract incentives for Capital Asset Projects to structure contracts to provide an equitable balance of risks; ensuring each party bears responsibility for its own actions, rewarding contractors for generating savings while protecting the taxpayers from paying for contractor negligence. We expect these changes to fundamentally affect the way the NNSA reviews its projects and interacts with its contractors to continue to drive efficiencies while delivering on our mission under current fiscal constraints.

In the last year, NA–APM's efforts resulted in $20 million in reimbursements from contractors as we moved to more fully utilize our contracts to hold them accountable for unsatisfactory performance. We issued an unambiguous design policy for our complex nuclear projects ensuring that sufficient design work (90 percent) is completed prior to approving project baselines at CD–2. Of non-major projects completed since 2007 with the construction budget baseline established in 2006 or later, 83 percent (10 out of 12) were delivered on time and at or under budget. These 12 non-major projects with a combined budget of $311 million were delivered more than $32 million under budget. We are confident that the lessons learned in delivering this work are applicable and scalable to the major systems projects we have had problems with in the past.

A third management change is to put more focus on cost planning relative to budgeting and execution, particularly in today's fiscal climate. Key decisions about priorities and resource allocations must be made centrally within the NNSA, rather than left solely to individual sites. The NNSA Act is clear that planning, programming, budgeting and financial activities comport with sound financial and fiscal management principles. Over a year ago, the NNSA embarked on a multi-year, iterative process with DOD's Office of Cost Assessment and Program Evaluation (CAPE) to conduct a rigorous analysis to try to determine how to best meet the President's nuclear strategy and the resources it will take to both accomplish the current program of work as well as to recapitalize our infrastructure. This ongoing effort will continue to inform our planning and programming decisions and will be the foundation upon which we build successive out-year budgets.

In order to further improve transparency with Congress and to further drive efficiencies into our program planning and execution, the NNSA's fiscal year 2014 budget request makes some significant changes to our budget structure.

In the fiscal year 2014 budget, the Infrastructure and Operations (NA–00) organization gains budget authority which will move the NNSA towards a tenant-landlord site model in which NA–00 is the landlord and the program offices are now tenants. As a result of this reorganization, the NNSA is proposing to eliminate the Readiness in Technical Base and Facilities (RTBF) GPRA unit in our budget and split these activities between the existing Site Stewardship unit and "Nuclear Programs" within Defense Programs. The activities managed by NA–00 would be added to Site Stewardship under a new subprogram titled "Enterprise Infrastructure" which would encompass Site Operations, Site Support, Sustainment, Facilities Disposition, and site infrastructure-related construction. Nuclear Programs will provide for capability investments and capital construction projects that uniquely support the mission of Defense Programs.

The Defense Nuclear Nonproliferation appropriation account of the fiscal year 2014 budget request has been restructured to include the Nuclear Counterterrorism Incident Response (NCTIR/NA–40) and Counterterrorism and Counterproliferation Programs (CTCP/NA–80) programs, both of which include activities transferred out of the Weapons Activities appropriation. By drawing together these NNSA programs in the Defense Nuclear Nonproliferation appropriation, we strengthen existing synergies and cooperation among these functions. In doing so, we provide priority and emphasis to the NNSA programs that are responsible for implementing the President's nuclear security priorities for reducing global nuclear dangers and the 2010 Nuclear Posture Review (NPR) which "outlines the administration's approach to promoting the President's agenda for reducing nuclear dangers and pursuing the goal of a world without nuclear weapons, while simultaneously advancing broader U.S. security interests." This change in budget structure will present with greater clarity the total funding and level of activity undertaken by the NNSA in this area, which the NPR identifies as the highest priority nuclear threat facing the Nation. At the same time, this realignment ensures that the Weapons Activities appropria-

tion is now more focused on stockpile and related activities, such as physical and cyber security.

WEAPONS ACTIVITIES

Defense Programs Overview

After adjusting for the infrastructure-related budget realignments described previously, the fiscal year 2014 Defense Programs portion of the Weapons Activities account is $5.1 billion or $410.2 million above the fiscal year 2013 continuing resolution level, constituting a 9 percent increase. As the President has committed, the NNSA is strategically modernizing our nuclear weapons infrastructure, weapons systems, and the supporting science to ensure a safe, secure and effective deterrent and to certify the stockpile without underground nuclear testing. Within today's constrained fiscal environment, we have closely scrutinized our strategies, plans, processes, and organization to ensure we make the most of our resources. The results of the NNSA and DOD budget-driven requirements analysis has forged a stronger link between DOD's requirements and the NNSA's resulting resource needs across the nuclear security enterprise. Some highlights include a new strategy for the conduct of Life Extension Programs (LEPs); an updated and more complete plutonium strategy; a refocusing of our science and infrastructure investments on the capabilities most urgently needed; a reorganization of the operations of facilities accounts and major infrastructure project responsibilities within NNSA's Defense Programs; and a significant effort to identify and implement management efficiencies. Each of these critical areas was determined following enormous effort to make smart business decisions on resourcing the highest priority mission work.

Life Extension Programs Strategy and Execution

The DOD's "3+2" strategy calls for the transition of four warheads that make up the ballistic missile portion of our stockpile to be transitioned, over the next 25 years, to three life-extended, interoperable warheads that DOD could flexibly deploy across different missile platforms. Further, we will transition the three bomb/cruise missile warheads in the stockpile to two warhead types as part of their life extension.

In January 2013, the Nuclear Weapons Council (NWC) changed the schedule and cumulative production quantity for the W76–1 program. This change reduced the total LEP production quantity and realigned the end of the production period for all operational units from fiscal year 2021 to fiscal year 2019. Specifically, the scope and schedule parameters for the program in fiscal year 2013 and fiscal year 2014 remain unchanged as the program will be executing steady-state rate production, and the annual production rates are the same for both fiscal years.

Regarding the B61 LEP, the NWC selected the option (3B) which satisfies the minimum DOD threshold requirements at reduced life cycle costs. Option 3B maximizes the reuse of nuclear and non-nuclear components while still meeting military requirements for service life extension and consolidation of multiple versions of the B61 into the B61–12.

Following the W76 and B61 LEPs, the first of the LEPs to which the 3+2 strategy applies is the W78/88–1. A joint DOD/NNSA Enterprise Planning Working Group developed schedules reflected in the forthcoming fiscal year 2014 Stockpile Stewardship and Management Plan (SSMP) which considers alignment of warhead development and production schedules with DOD system platform upgrades and balancing the workload across the nuclear security enterprise. Once developed as part of the Phase 6.2A activities, the DOD Cost Assessment and Program Evaluation (CAPE) team will review and the NWC will approve cost estimates for the W78/88 and future LEPs.

Engineering development for an alteration to the W88, the W88 Alt 370, is also under way. This Alt will address certain lifetime requirements by modernizing the Arming, Fuzing & Firing system and improving surety by incorporating a lightning arrestor connector. It will also provide additional logistical spares for the life of the system. The NNSA will complete the W88 Alt 370, the neutron generator replacement, and gas reservoir replacement will be completed at the same time with a planned first production unit for December 2018.

Plutonium Strategy

NNSA is committed to ensuring continuity of required plutonium support capabilities and mission functions to include analytical chemistry, material characterization, manufacturing, and storage functions. The strategy for doing so is encompassed by the Defense Programs Plutonium Strategy that expands our capability over the next decade to achieve a 30 pits-per-year capability by 2021 to support the W78/88–1 LEP activities. Achievement of this capability requires additional invest-

ment in the Plutonium Sustainment program along with efforts to free up space within the PF4 facility at LANL by cleaning out the existing vault space and installing additional equipment in existing facilities.

This strategy is critical for today's stockpile and is independent of the deferral period for the Chemistry and Metallurgy Research Replacement-Nuclear Facility (CMRR–NF). We are on track to move operations out of the existing Chemistry and Metallurgy Research facility at Los Alamos National Laboratory in 2019. Execution requires a $120 million reprogramming approval for fiscal year 2012 funds. This reprogramming is urgent for our workforce. NNSA and CAPE are developing a business case analysis of the plutonium strategy by August 2013. CMRR–NF deferral provides NNSA the opportunity to balance funding and requirements, and to evaluate an integrated, long-term plutonium capability solution.

Research Development Test & Evaluation (RDT&E)

Last year, we commemorated the 20th anniversary of the end of underground nuclear weapons testing in the United States. Shortly after that decision in 1992, the Stockpile Stewardship Program was established to provide the science, tools, and critical skills necessary to certify that the stockpile is safe, secure, and effective without the need for nuclear testing. Since that time, we have been filling our toolbox with the cutting-edge science needed to accomplish this formidable challenge. Maintaining a stockpile under these conditions requires the best science and technology in the world. Breakthroughs have occurred that have enabled us to achieve this goal for today's stockpile. But as we look into the future, we see the need for the enhanced use of our science tools to gain better assurance that as our stockpile ages it will continue to be safe, secure and effective. The modern tools of Stockpile Stewardship not only serve as our insurance policy against a return to nuclear testing, but they also are increasingly revealing the "first principles" physics and materials' properties of our weapon systems.

Priorities of the Stockpile Stewardship Program include the development of capabilities to design and certify LEP options; preservation of specialized skills needed for maintenance of the nuclear stockpile by a generation of scientists who will not have worked with those experienced in nuclear testing; development of capabilities enabling timely resolution of issues from significant finding investigations resulting from surveillance observations; enabling annual assessment of the stockpile and associated operational decisions; and reducing nuclear dangers through the extension of capabilities used for assessments of foreign state weapons activities.

In the fiscal year 2014 budget request, the Science Campaigns seek funding to provide the science underpinnings of our Plutonium Strategy and re-use options for the future stockpile, as well as advanced certification of nuclear explosive package options with improved surety to support LEP decisions and advanced diagnostics and experimental platforms (particularly optical imaging and radiography) for future subcritical experiments that augment and guide our plutonium science research. Through the National Boost Initiative (NBI), the Science Campaign is improving physics models for primary fission "boost." This understanding is essential as we reduce the stockpile, especially since we will be re-using many nuclear components.

The fiscal year 2014 budget request for the Inertial Confinement Fusion and High Yield Campaign features an increased emphasis on non-ignition high energy density (HED) experiments, diagnostics, and experimental platforms development to support reuse and stockpile modernization. Such platforms and diagnostics will help validate secondary performance and surety technologies for the future stockpile, as well as help provide radiation effects testing of non-nuclear components. In addition, the budget request supports progress on achieving ignition, or thermonuclear burn in the laboratory, in accordance with the Path Forward report supplied to Congress in December 2012. This report described our plan for resolving discrepancies between experimental results at the National Ignition Facility (NIF) and the prediction of our codes, as well as the development of alternate ignition approaches (polar drive, direct drive, and magnetic drive). An Independent Advisory Board on ignition will be a subpanel of new Federal Advisory Committee being formed to provide advice on NNSA stockpile stewardship challenges. Finally, the budget seeks support for the continued safe and efficient operation of NNSA's three major High Energy Density facilities: NIF, OMEGA, and the Z machine.

The budget in fiscal year 2014 for our Advanced Simulation and Computing (ASC) program seeks to implement the "3+2 Strategy" agreed to by the NWC described earlier. To implement that strategy, an understanding of plutonium reuse and performance, which ASC simulation helps provide, is critical. Further, the ASC budget seeks support for improved and more responsive full system modeling and simulation capabilities for annual assessments, LEPs and significant finding investigations

that provide enhanced fidelity in the stockpile. ASC is uniquely challenged by supercomputing technology advances that are forcing an evolution in computer architectures that are inconsistent with current methods used in our national computational tools for stockpile assessment. In response, ASC is coordinating high performance computing technology, research and development with the DOE Office of Science's Advanced Scientific Computing Research (ASCR) office, and attempting to maintain adequate essential skills and capabilities to support current and future requirements under flat budget restrictions. Foreign nuclear weapons assessments will continue to rely on our Nation's nuclear weapons code base.

Strategic Management

Building on the strength of our experience working with DOD this past year, we are enhancing our partnership this year in areas where both of us will benefit. Specifically this year, studies are being conducted with DOD to find efficiencies and to identify workforce priorities. The "3+2 strategy" and the aggressive LEP schedule associated with that strategy are being implemented. Modernization of critical mission support infrastructure is focusing on the Uranium Processing Facility (UPF) with acceleration out of Building 9212, and moving forward with the plutonium Strategy.

Our enhanced partnership with DOD will be evident not only this year but also over the Future Years Nuclear Security Program (FYNSP) period (fiscal year 2014–2018), and beyond, throughout the next 25 years as the 3+2 Strategy, the LEPs, and modernization are all at various stages of planning and execution. The 25-year Strategic Plan will be described in detail in the forthcoming fiscal year 2014 SSMP.

NNSA is taking the initiative to improve the effectiveness and reduce the cost of its operations and business practices. We understand that every dollar counts in these fiscal times and NNSA will build upon a number of successful efforts in the past to improve our contractors operations and efficiencies. We have already saved considerable money through our supply-chain management initiative, planned consolidation of the Y–12 and Pantex contracts, and pressing our contractors to change their benefit plans for employees, particularly pension plans. The funding requested in fiscal year 2014 reflects anticipated "Workforce Prioritization" and "Management Efficiencies" savings as part of the NNSA/DOD joint study.

Defense Nuclear Security Overview

The NNSA recently reorganized our security organization to establish clear lines of authority for responsibility and institutionalize a formal performance assessment capability. The Office of Defense Nuclear Security's primary missions are policy development, strategic planning, and performance assessments of NNSA site activities. We also realigned security management for operational direction, resource execution authority, and field assistance activities to the Office of Infrastructure and Operations (NA–00) which is consistent with its existing line management authority over all NNSA sites. NNSA is changing our culture of how we assess security so that we do not rely on reports provided by others but instead assess operational readiness of security at the sites by dispatching experts from the Office of the Chief of Defense Nuclear Security.

We are also committed to hiring the right caliber of security professionals; those with operational nuclear security field experience, to reshape and continue to improve the culture of nuclear security at NNSA. This initiative is focusing our leadership on instilling a culture that embraces security as an essential element of the NNSA mission, which is to provide the utmost protection for national security resources.

DNS is also hiring 15 additional Federal security experts in fiscal year 2013 to conduct performance-based assessments at each of the NNSA sites. These security professionals will visit each site, to perform assessments of security readiness by directly observing security operations, and program implementation.

In the period following the Y–12 security event on July 28, 2012, we have learned a lot about our organization, the assumptions we had made, and how we communicate. The incident at Y–12 was a completely unacceptable breach of security. The security of our Nation's nuclear material is our most important responsibility, and we have no tolerance for such unacceptable performance. We have taken strong and decisive action to fix the issues that led to the incident at Y–12.

We immediately shared lessons learned with all the NNSA Field sites and directed each to perform self-assessments related to those concerns found at Y–12. We directed the sites to assess: (1) security culture, (2) formality of operations, (3) rules of engagement procedures, and (4) security system maintenance and compensatory measures. We initiated efforts to establish a robust assessment model, which has included the new Acting Chief of Defense Nuclear Security leading teams of security

professionals to conduct assessments of all NNSA sites to determine security readiness and review of Field Office and contractor security performance.

We are executing a deliberate process to restore the DOE directives as the baseline safeguards and security policy for NNSA.

Using NNSA's Corporate Performance Evaluation Process, our assessment of the Y–12 management and operating contractor's performance resulted in lost award fee totaling $12.2 million, which included 100 percent of their possible security-related fee and a negative overall management fee adjustment of $10 million.

Cyber Security

The fiscal year 2014 budget reflects the consolidation of the activities managed by the NNSA Office of the Chief Information Officer under NNSA CIO (NCIO) Activities. The consolidation under a single account will allow more effective and integrated management of the program. Cyber Initiatives are supported by IT Investments and this change will provide better alignment of resources to focus on the emerging threat and to deliver capabilities that allow our employees to work anywhere, anytime, on any device. The fiscal year 2014 budget includes $148 million for the NCIO activities which includes support for Federal IT as well as all programmatic funding for cyber security (covering Federal employees and our Managing and Operating Contractors).

Providing an effective enterprise IT/Cyber strategy is critical to enablement of the OneNNSA strategy, the achievement of cost savings, and the deployment of shared services for the nuclear security enterprise. The NCIO leads Federal efforts to deploy innovative IT solutions, research and develop cyber defense technologies, and to deploy effective cyber security tools such as continuous monitoring, data loss prevention, and strengthened access controls. The NCIO focus for the next 5 years is to continue execution of our integrated strategy of IT Transformation (the NNSA Network Vision (2NV)), improved security monitoring of our environment (Joint Cyber Coordination Center (JC3)), and deploying next generation cyber defense capabilities that alter the economics of the cyber battlefield (Cyber Sciences Laboratory (CSL)).

The NCIO made significant progress towards the OneNNSA vision in fiscal year 2013. The organization deployed a new, secure wide-area network (OneNNSA Network), a first of its kind federated Identity Management solution (a critical path step to full HSPD–12 implementation), a unified communications solution and agency wide social network allowing for the collaboration of over 45,000 employees (ONEvoice), and a state-of-the-art cloud services broker (YOURcloud) that will provide a foundation for cloud computing adoption and was recently recognized by Excellence.gov as the most innovative project in government.

Fiscal year 2014 will build on these achievements and progress all three elements of our integrated strategy forward. For 2NV, NCIO will consolidate data centers using YOURcloud, modernize our applications to reduce legacy IT costs and enable a mobile workforce, and consolidate our intranets, websites, and file servers to common platforms to reduce costs. NCIO will improve our classified network monitoring capabilities, provide monitoring for 2NV investments, and strengthen the partnership with DOE for unclassified JC3 capabilities. For CSL, NNSA will execute a robust cyber defense R&D portfolio center around three signature programs: (1) Mission Resilience and Assurance, (2) Big Data and Behavioral Cyber Analytics, and (3) Scalable Testing of System Cyber Dynamics.

DEFENSE NUCLEAR NONPROLIFERATION

As I mentioned earlier, we decided to align all the global nuclear security activities under the Defense Nuclear Nonproliferation account. This will strengthen our focus on countering nuclear terrorism and proliferation, while encouraging cooperation among our programs in this area. The Request includes $2.1 billion for the DNN appropriation which includes the NNSA Defense Nuclear Nonproliferation (DNN/NA–20), Nuclear Counterterrorism Incident Response (NCTIR/NA–40), and Counterterrorism/Counterproliferation (CTCP/NA–80) programs.

Office of Defense Nuclear Nonproliferation

As we look to the future, we see challenges and opportunities across the globe. Over the past 4 years we have seen increased focus, determination and expansion of activities with our international partners. This has been due largely to the momentum created by the Nuclear Security Summit process to meet shared nuclear security goals. Russia, for example, has announced its intention to be a full partner with us, and remains a critical partner in the efforts to secure the most vulnerable nuclear materials and keep them out of the hands of proliferators and terrorists. The Russians are not alone, and dozens of countries have stood alongside President

Obama and the United States at two Nuclear Security Summits to show their commitment to our shared cause.

One of our most important accomplishments has been to support the administration's commitment to secure the most vulnerable nuclear material across the globe in 4 years. Since 2009, our efforts to secure plutonium and highly enriched uranium (HEU) around the world have accelerated to make it significantly more difficult to acquire and traffic the materials to make an improvised nuclear device. I am proud to say that we are very close to meeting our goals to remove or dispose of 4,353 kilograms of highly enriched uranium and plutonium in foreign countries by the end of 2013, and equip 229 buildings containing weapons-usable material with state-of-the-art security upgrades, though some challenges remain.

On April 5, 2013, we completed the removal of all HEU from the Czech Republic, making it the 10th country to be completely cleaned out of HEU in the last 4 years. The NNSA will complete prioritized removal of vulnerable nuclear material from three more countries this year.

The 4-year effort allowed us to accelerate some of our most important work, but it has been accurately described as "a sprint in the middle of a marathon." After our 4-year sprint, there will be much left to complete in the areas of the elimination, consolidation and securing of nuclear and radiological materials worldwide. Nuclear and radiological terrorism continues to be a grave threat, nuclear and radiological WMD technology and expertise remain at risk, and materials of concern, such as plutonium, still are being produced. While the challenges are substantial, they are not insurmountable.

NNSA, working with its international partners and with strong support from the White House, will continue to eliminate, consolidate and secure high risk materials to ensure that terrorists can never acquire a weapon of mass destruction. The fiscal year 2014 request for ODNN provides $1.8 billion to: continue efforts both domestically and internationally to convert research reactors and isotope production facilities from HEU to LEU, consolidate nuclear material in fewer locations, and permanently eliminate it where possible, improve and sustain safeguards and the security of nuclear materials at those locations, support the adoption of security best practices, prioritize efforts to secure or remove high-risk radiological sources, prevent illicit trafficking of nuclear and radiological material through the provision of fixed and mobile detection equipment and export control training, and work in collaboration with international partners to build global capability in these areas.

We will continue to pursue a multi-layered approach to protect and account for material at its source, remove, downblend or eliminate material when possible, detect, deter, and reduce the risk of additional states acquiring nuclear weapons, and support the development of new technologies to detect nuclear trafficking and proliferation, as well as verify arms control treaties.

We owe it to the American people to continually reevaluate our work and make strategic decisions for the future. The fiscal year 2014 budget request takes a thoughtful look at the Mixed Oxide (MOX) Fuel Fabrication Facility project and our plutonium disposition options. The United States remains committed to disposing of excess plutonium, and we believe this review will ensure that we are able to follow-through on our mission in the decades to come. The U.S. plan to dispose of surplus weapons-grade plutonium by irradiating it as MOX fuel has proven more costly to construct and operate than anticipated. Considering these unanticipated cost increases and the current budget environment, the administration has begun assessing alternative plutonium disposition strategies and identifying options for fiscal year 2014 and the out-years. During the assessment period, the Department will slow down its MOX project. We are committed to disposing of excess plutonium, we recognize the importance of the U.S.-Russia Plutonium Management and Disposition Agreement, and the United States will continue to engage key program partners and stakeholders as the assessment of alternative plutonium disposition strategies is developed.

Our continued focus on nonproliferation and nuclear security efforts is vital. The threat of nuclear terrorism and WMD proliferation remains. Detonation of a nuclear device anywhere in the world could lead to significant loss of life, and extraordinary economic, political, and psychological consequences. We must remain committed to reducing the risk of nuclear terrorism and WMD proliferation.

Nuclear Counterterrorism Incident Response

This year, the request for NCTIR will support a strategy focused on reducing nuclear dangers through integration of its subprograms; Emergency Management, Emergency Response, Forensics and International activities supported by training and operations.

In fiscal year 2014, the program will invest in leverage at a distance capability for the Nuclear Emergency Support Team, maintain training of the Consequence Management Home Team, sustain stabilization cities, complete improvements to U12P-tunnel, address and sustain emergency management requirements, maintain the Emergency Communications Network, and continue supporting international partners. The NCTIR program will continue to maintain essential components of the Nation's capability to respond to and manage the consequences of nuclear incidents domestically and internationally, and continue to conduct programs to train and equip response organizations on the technical aspects of nuclear counterterrorism.

Counterterrorism and Counterproliferation Programs

The aforementioned budget realignment includes the Counterterrorism and Counterproliferation, or CTCP, program office, which we stood up last year. The funding request for CTCP includes the transfer of the discontinued National Security Applications funding into a consolidated and substantially revised budget line to support the highest priority counterterrorism and counterproliferation technical work, including the study of Improvised Nuclear Devices and other non-stockpile nuclear device threats. This increased funding will support unique nuclear device-related technical contributions derived from NNSA's core nuclear science and technology expertise. This activity supports interagency policy execution, DOD and Intelligence Community customers, and DOE's own emergency response operations.

NAVAL REACTORS (NR)

Naval Reactors' request for fiscal year 2014 is $1.246 billion, an increase of 15 percent over the fiscal year 2012 request, to continue safe and reliable naval nuclear propulsion. The program directly supports all aspects of the U.S. Navy's nuclear fleet, which encompasses the Navy's submarines and aircraft carriers, over 40 percent of the U.S. Navy's major combatants. Currently, the nuclear fleet is comprised of 54 attack submarines, 14 ballistic missile submarines, 4 guided missile submarines, and 10 aircraft carriers. Over 8,300 nuclear-trained Navy sailors safely operate the propulsion plants on these ships all over the world, and their consistent forward presence protects our national interests.

Continued safe and reliable naval nuclear propulsion requires that NR maintain the capability to anticipate and immediately respond to small problems before they become larger issues. Our technical base and laboratory design, test, and analysis infrastructure is required for us to thoroughly and quickly evaluate technical issues that arise from design, manufacture, operations, and maintenance, ensuring crew and public safety without impeding the mission of our nuclear-powered fleet. Uncompromising and timely support for safe operation of the nuclear fleet continues to be the highest priority for Naval Reactors.

Beyond fleet support, Naval Reactors continues efforts on its three important new projects: the design of the *Ohio* Replacement reactor plant; the refueling overhaul for the S8G Land-based Prototype reactor; and recapitalization of our naval spent nuclear fuel infrastructure. Each of the projects is critical to fulfillment of the Navy's longer-term needs.

The current *Ohio*-class ballistic missile submarines are reaching the end of their operational lives and will begin to retire in 2027. Naval Reactors is designing and developing a life-of-ship core for the *Ohio* Replacement that will increase SSBN operational availability and reduce strategic deterrence submarine procurements from 14 to 12. The fiscal year 2014 request is $125.6 million and supports the Navy's schedule and progresses on reactor plant design needed for procurement of reactor plant components beginning in 2019. This request is essential to component design, procurement and ship construction.

The Land-based Prototype provides a cost-effective testing platform for new technologies and components before they are introduced to the fleet, and is essential for the testing of new materials and technology for the *Ohio* Replacement life-of-ship core. To preserve this vital research, development, and training asset for the long-term and to achieve life-of-ship core for the *Ohio* Replacement, core development and preparations for the refueling overhaul must continue in fiscal year 2014. The fiscal year 2014 request for the S8G Land-based Prototype Refueling Overhaul is $143.8 million.

Finally, the Spent Fuel Handling Recapitalization Project (SFHP) supports the Navy's refueling and defueling schedule for nuclear-powered aircraft carriers and submarines by providing the capability to unload and return spent fuel shipping containers to the shipyard. The fiscal year 2014 budget includes $70 million to continue conceptual design for a new facility. Significant portions of the existing Expended Core Facility are more than 50 years old, and were not designed for its current mission of processing and packaging spent naval nuclear fuel for permanent

dry storage. The existing facility is not capable of handling full-length aircraft carrier fuel from M–290 shipping/storage containers. The need to prioritize operational fleet support following enactment of the Budget Control Act resulted in a year and a half delay to the project; the fiscal year 2014 request supports this revised schedule. Further delay to the SFHP would create a need for additional M–290 containers, at approximately $100 million per year of delay, for temporary storage.

Like our Weapons program, over the last year, DOE, NNSA, and the DOD CAPE conducted a comprehensive analysis of Naval Reactors' program and validated that our requirements are consistent with the President's overall strategy.

OFFICE OF THE ADMINISTRATOR

The NNSA's Office of the Administrator (OA) appropriation provides the Federal salaries and other expenses of the NNSA mission and mission support staff, including the Federal personnel for Defense Programs, Defense Nuclear Nonproliferation, Emergency Operations, Defense Nuclear Security, Acquisition and Project Management, the Office of the Chief Information Officer, Safety and Health, the Administrator's direct staff, and Federal employees at the Albuquerque Complex and site offices. The OA account is an essential enabler of the Federal roles and missions that are the heart of our Enterprise.

The OA account continues to streamline operations and provide staffing for efficient and effective oversight to our programs. We have taken aggressive measures to significantly downsize the account, including cutting travel and support services by about one-third and offering voluntary separation incentive payments and early retirement to help right-size our workforce.

IMPACT OF SEQUESTRTION

The sequestration cuts now in effect will hamper NNSA's ability to carry out the full range of national security activities planned in our fiscal year 2013 budget. These cuts are coming 5 months into the current fiscal year, forcing the NNSA to absorb the spending reduction in a 7-month period rather than an entire year. Under the current law, the NNSA fiscal year 2013 budgetary resources have been cut by roughly 7.8 percent, which equates to an effective reduction of over 13 percent when measured over the balance of the fiscal year. Under sequestration, the reduction for the entire NNSA is approximately $900 million. This results in the Weapons Activities appropriation is approximately $600 million below the fiscal year 2013 request levels, and more than $250 million below the fiscal year 2012 levels.

Prior to sequestration taking effect, NNSA informed Congress through hearings on two separate occasions that thousands of contractor jobs at our labs and plants could be affected either through work-hour reductions or other personnel actions with Directed Stockpile Work and the Life Extension Programs being impacted the greatest. While we continue to believe that sequestration will cause significant impacts, these preliminary impact statements, which were formulated in a period of uncertainty regarding the precise provisions of the final Continuing Resolution (CR), need to be revised.

Now that we know the actual terms and conditions of the CR, NNSA is working closely with our partners in the labs and plants to develop mitigation strategies that will protect our highest priority workload to the best of our ability given the current resources. Our highest priority will remain the safety and security of our nuclear security enterprise. Once this review is completed, the Department plans to use a combination of the Operating Plan required by the CR, as well as a reprogramming to address the most critical funding needs and implement mitigation strategies to give program managers the flexibility they need to best handle the reductions across the enterprise.

Due to the indiscriminate nature of these cuts and view that it remains poor policy, the President's fiscal year 2014 budget request does not reflect sequestration's impacts; either in fiscal year 2014 or across the FYNSP.

CONCLUSION

The fiscal year 2014 budget reaffirms the national commitment to the President's nuclear security vision, applying world-class science that addresses our Nation's greatest nuclear security challenges and building NNSA's 21st century nuclear security enterprise through key investments in our people, programs and infrastructure. We are looking toward the future and building an organization that will ensure success. I look forward to working with each of you to help us do that. Thank you.

Senator UDALL. Thank you, Ms. Miller.

The subcommittee, as I mentioned, is proud to have Senator Donnelly here. Would you like to start with the first round of questions? I know your time is valuable.

Senator DONNELLY. Thank you, Mr. Chairman.

What are the implications for NNSA of having a lot of scientists who have never worked with the underground testing? How is that going to affect your operations?

Ms. MILLER. Thank you, Senator. That is actually a very good, interesting question.

Of course, we have now been without underground testing since 1992. So we have years of this. But as I think a number of us in the room know, none of us are getting any younger, and that means——

Senator DONNELLY. That would be true for me as well. [Laughter.]

Ms. MILLER. So I think that it is clearly something that is at the front and center for those of us concerned with the future of the stockpile as we look to make sure that, first of all, there is knowledge transfer, first and foremost, and there has been quite a lot of that. But also, the stockpile stewardship program that began in the 1990s really was based on the idea that we would hopefully not to go back to underground testing and we needed to find a way to make sure we could do what we have to do with the stockpile without it.

So I think that there has been a terrific effort, and we have seen actually, I think, the kinds of results that people maybe did not anticipate how good they would be from the modeling and simulation work that has gone on over the last number of years, and we continue to develop that. It is something that we know is absolutely critical to not only the stockpile of today but to the extended life of the stockpile, all of the science base for that.

Senator DONNELLY. In regards to the stockpile, what is your confidence level given the continued use that we have had of LEPs?

Ms. MILLER. First of all, it is the job of the head of U.S. Strategic Command, as well as the laboratory directors, to write a letter to the President every year to discuss the state of the stockpile in their opinion, which is certainly going to be more to the point than mine with their training.

But I would say that we, based upon what we, together with our laboratory directors, know are very confident in the ability of that stockpile to deliver as it has been promised to deliver. But we also, with regard to LEPs, know that we are getting into a large cycle right now where we are going to have to master the LEPs in order to be able to continue to assure that stockpile.

Senator DONNELLY. In regards to physical security of the NNSA facilities, since the Y–12 event, what have we done to try to make the facilities more secure?

Ms. MILLER. In the aftermath of the Y–12 event, of course, there were a number of reviews that were conducted both on behalf of the Secretary of Energy and the Inspector General. There were a number of reviews done. But I think the one that had the most direct effect so far on the NNSA and how we do this was the review conducted at the request of the former Administrator and myself

by General Sandra Finan, who at that time was in the NNSA on loan from the Air Force—conducted a review of how we do what we do in the area of security. As she very clearly stated, both in her report and in subsequent testimony, how we were doing security really was not serving anybody very well because it was so disconnected from what was actually—the parts of security, which is to say the physical security at the site on the ground, was disconnected from a headquarters group whose job was to promulgate policy. It is why I chose to mention it specifically in the testimony.

What we have done to change this—I would point to two main things. First of all, it was the creation of that infrastructure and operations group to bring the field offices into the line of NNSA so that we can have a mechanism now to drive consistency in the application of policies across the sites, and you do not have sites that, for whatever reason might be for that site, has decided to take the policy and do it a different way. So that is one piece of it.

The other piece of it within the NNSA is to establish that strong security policy group which also has a strong assessment capability so that they can deliver the policy instructions and come back in and see how is it actually happening.

At the same time, on the contractor side—I mentioned in the testimony driving accountability with the contractor—this is absolutely critical, will be critical in the success because, after all, the protective force is contractor-based. So our deep involvement with our contractor partners on our expectations and also our assessment of their performance will be critical to this.

Senator DONNELLY. Thank you.

Mr. Chairman, thank you.

Senator UDALL. Thank you, Senator Donnelly. It is great to have you here.

Let me pick up on that particular theme, Administrator. Following the Y–12 break-in by the 82-year-old nun and her colleagues, a principal finding was that there was lack of oversight by the NNSA and, in particular, the contractor assurance system whereby the contractor writes self-evaluations of their performance and then gives it to NNSA to help determine their award fee. Do you want to expound on what you are doing to ensure more rigorous oversight of this process?

Ms. MILLER. Yes. Thank you, Senator.

Senator UDALL. I know you would want to talk to this.

Ms. MILLER. I do. Thank you.

Again, I would start by saying that the incident at Y–12—and this is probably true of whatever challenges the organization faces—is first and foremost a management issue and a management failure. When you look to how to address this for the future, if you do not start from that premise, you may find yourself with many little fixes that do not, in fact, address the problem at its root.

To manage an organization in disconnect between the people in Washington and the people across the country I would say is a system that was appropriate and worked well for many years throughout the Cold War and certainly in a period where communications were what they were. But for us to drive accountability from the

Administrator on through the organization, we have to be organized and working together in a very different way.

The contractor assurance system, in and of itself, we believe is not—and we have had this reviewed by many people from the outside—conceptually is the right way to go. Certainly our laboratory partners are vocal about the need for them to be able to do their work without burdensome oversight. Of course, the devil is in the details: what is burdensome to whom.

I would say on our side what we believe is we need to be able to better train our staff, communicate what we mean by all of this, and make sure that the accountability is all up and down the NNSA, as well as in the contractors, so that that contractor assurance system does not equal a rubber stamp. I think we found ourselves in a place where we had many measures of effectiveness of the contractor, which did not necessarily tell you what was happening. That certainly was the case with security. Then we had people who, because communicating in such a large organization across so many places had been challenging to people for years, had not really driven an understanding of what it meant to operate under a contractor assurance system.

So all of those components are what we are working very hard to address, both organizationally driving the accountability and setting it up in a way that we can see it all and people are connected, but also that communications and training that the Federal staff need to be able to perform their oversight duties appropriately.

Senator UDALL. I very much appreciate your willingness to acknowledge this starts with management. What I think I hear you saying is that the contractor assurance system provides a valuable look from one point of view, but there have to be other checks and balances as a part of that system starting with management.

Ms. MILLER. That is exactly right, Senator.

Senator UDALL. I was the CEO of the Outward Bound School for years. Our focus was on safety, and whenever we had an incident, we did an internal review, as we called it. Then we had an external review to double check our assumptions, our facts, and our conclusions. I think what I hear you saying is that approach has to be a part of what is put into place given what happened.

Ms. MILLER. There absolutely has to be a healthy look at it from both sides ongoing in all of these areas, security, safety, performance of the mission, and all of them.

Senator UDALL. In some cases, we would even have a third review in my situation.

Ms. MILLER. I agree, and one wants to get that done before a problem not afterwards.

Senator UDALL. Thank you for that.

Let me move to the CAPE office. I know you mentioned you are standing up that operation. Can you talk a little bit about how that will be implemented?

Ms. MILLER. I can.

I would say that in the NNSA, while we have, since creation and as it was directed in the enabling statute, presented Congress with a 5-year budget, which is atypical in DOE where it is presented a year at a time, the actual exercise within the organization has really focused on the budgeting and execution portion. The program-

ming and planning has been not as strong as it needed to be. What I found in the organization—and it was certainly not just me, but I have a budget background, so I noticed it particularly—is that decisions tended to be made very low level, which have a strong impact ultimately on resource decisions that the senior folks are left to deal with, in the end very little room to address issues. To make decisions without good analysis, independent analysis, and hard data seems to me to not be in the best interest of the organization long-term, and in the end is less defensible certainly to Congress or anybody else.

So I felt very strongly that in addition to a very strong budget office, which the NNSA absolutely does have, this facility to have independent analysis was absolutely critical to the success of the organization both because we have large construction projects but also because we have large, ongoing projects such as the LEPs and so many other demands on us throughout the nonproliferation programs and all the other work the NNSA does, it is in the best interest of everybody if those resource decisions are made, again, based on good analysis. So it was very much a strong interest of mine to get this going inside.

Now, with respect to how this relates to DOD's CAPE, I had the opportunity, when I was still working at the Office of Management and Budget (OMB) in the mid-2000s working on the NNSA portfolio, to get involved with the CAPE and the NNSA together to begin to look at potential costs of modernizing the infrastructure. So I had a connection with the CAPE for quite some time and the way they do their business.

One thing I came to the conclusion in NNSA and that is with respect to cost analysis itself, the "CA" part of CAPE, I would argue that this capability, to the level that it is done in DOD is almost unique to DOD. Those people know how to do it. They have been doing it. They tend to stay put, and to create that out of nothing is difficult, very difficult.

So instead, I had a very good relationship especially over the last year with the Director of the CAPE, Ms. Christine Fox, with whom I conducted a long, in-depth analysis of our resource needs. We were able to come to a good arrangement wherein we in the NNSA can continue to use the DOD CAPE's cost assessment capability and eventually grow our own by training people over there. But for the "PE" part, the program evaluation and analysis, that part we could stand up on our own over at NNSA, and that was the shop that I just mentioned. I think the two together give us what we need.

Senator UDALL. That is helpful, and I look forward to hearing more as that develops. Clearly, your background led you to see this and to create a hybrid, if you will, approach.

Let us turn to the 's' word—it is not a four-letter word, but it feels like one some days—"sequestration." What effect will it have on your major programs in terms of schedule delays? In particular, I am primarily focusing on the B61, the W76, and the uranium processing facility.

Ms. MILLER. I feel compelled, when I talk about sequestration, to talk about budget uncertainty overall. I would not be true to my budgeter background if I did not.

Budget uncertainty in my eyes starts, first and foremost, with the Continuing Resolutions (CR) that people live off of. So now I will layer sequestration on what we know as a fact of life.

Clearly, there is an effect on projects, especially the kinds of projects we run, whether they are construction projects, LEPs, frankly projects that we have going in other countries to secure borders, to secure material. Anything that plans out over several years that has a path to a cost and now cannot meet the plan, first and foremost, despite the mirage of a cash flow benefit, in fact will lead to higher costs for all of these projects by definition.

Senator UDALL. You are talking about CRs and sequestration.

Ms. MILLER. I would say for both, but sequestration on top of the planning challenges absolutely comes in and knocks us off our feet. I know you heard testimony yesterday from the Director of Sandia speaking very strongly about his concerns with respect to the B61 and the effect of sequestration. I spoke this morning for an hour with people from one of our communities that is absolutely reeling from being hit by sequestration and heard some really stunning stories of how individuals are not just on furloughs but people in businesses and how they are planning with their lives. Those are communities that we work closely with and we rely on to be strong for us in the work we need to get done. So I think the effect is profound and I am surprised that people do not get that.

Senator UDALL. Yes. I am tempted to try and categorize CRs and sequestration, which is worse, but I think they are both bad.

Ms. MILLER. I would rather not have either.

Senator UDALL. Yes. That is a job and responsibility we have yet to shoulder. We need to.

I am going to turn to a GAO recommendation that NNSA reevaluate the award for the combined contract at Y–12 and Pantex. Their principal finding is that the NNSA did not meaningfully assess—that is a quote, "meaningfully assess"—the estimated cost savings of some $3.4 billion in the winning proposal especially since NNSA's own internal estimate assumed a savings from the combined contract of about $840 million. Would you comment on the GAO finding?

Ms. MILLER. Senator, thank you. I will comment. I need to, of course, be careful about how I comment since this is still in open procurement. I will comment enough to say that we are announcing and have announced today that we will carry our a corrective action with respect to the GAO finding as they recommended. We, of course, were very pleased that GAO found, out of the 17 issues in front of them, 16 of them were not with merit. But on the one that they did find, we are going to carry out a corrective action on that. The various affected parties have been informed today and we will proceed with the process on that directly.

Senator UDALL. I look forward to seeing that. That is a nice batting average, 16 out of 17, but I know you want to hit 100.

Ms. MILLER. I am from Boston. [Laughter.]

Senator UDALL. I am staying away from that. The Rockies are my team except when you all come to town. [Laughter.]

You mentioned in your testimony we heard from the lab directors yesterday, and they are quite a talented trio. Dr. McMillan specifically indicated that you are all looking at a less costly strategy for

the CMRR involving a series of modular buildings instead of a large one. Can you comment on your thoughts on this approach and whether it holds promise for providing flexibility and lower costs? I know you mentioned, I think, a plutonium strategy. Again, please share your thoughts on all of this.

Ms. MILLER. Sure. Thank you.

First of all, I noted in your comments to open with, you mentioned what had been spent on the design of CMRR thus far, as well as the pit disassembly and conversion facility, again what had been spent on design. In both those cases, we did not proceed with construction.

So dealing specifically with the chemistry and metallurgy replacement building, I think like a lot of situations, budget crises drive you to work harder and sometimes better, and in this case I think better. We had a plan on the books for many years. It had not, frankly, been reassessed in light of a lot of things, and we found ourselves with a rather large bill just at the time when the money became particularly tight. That did cause us, together with our lab directors, to go back and review.

The approach that you heard about, the modular approach, is absolutely of great interest to us, but I will tell you that we are undertaking, with the CAPE, a business case analysis of that approach and a few others because we need this time to make sure that we have really looked at the options and did not just get behind the next thing that appeared and decided that that was the option.

Senator UDALL. We are going to move to the next panel, but I have two questions that I will put in the record. I know you will be willing to answer them for the record.

In particular, I want to just note your focus on the long-term vision I am learning at the helm of this committee and will draw some conclusions over time. But I think the President's goal of nonproliferation as a start and then ultimately a world that does not face the threat of nuclear weapons are worthy and important—I know there is broad bipartisan support for that approach. I think we should hold that as a goal. It is a long, winding road to reach it. It may take many generations, but I think it is crucial that we keep that. I know that is at the core of your philosophy and you reflect the President's philosophy.

Ms. MILLER. Absolutely.

Senator UDALL. Thank you for appearing today. We look forward to working with you further.

Ms. MILLER. Thank you.

Senator UDALL. You are free to do whatever else you have on your busy schedule, you may either go or you are welcome to stay. Thank you for being here.

Ms. MILLER. Thank you very much.

Senator UDALL. As the Administrator leaves, we will ask the second panel to come forward. We will begin as soon as you all are ready. [Paugse.]

Welcome, gentlemen. Thank you again for taking time out of your busy schedules to join the Strategic Forces Subcommittee. I think in the interest of time, we will move from my left to right, and if each of you would be willing to share 1 or 2 minutes of your

thoughts and then we will go right to questions. I want to make sure everybody has a chance to be heard, particularly in the question and answer period. Of course, if we do not get to everything that you would like us to know, the record will remain open for a number of days, not too many days, but will remain open for a number of days so you can submit additional comments.

So, Dr. Cook, we will open with you.

STATEMENT OF HON. DON L. COOK, DEPUTY ADMINISTRATOR FOR DEFENSE PROGRAMS, NATIONAL NUCLEAR SECURITY ADMINISTRATION, DEPARTMENT OF ENERGY

Dr. COOK. Chairman Udall and members of the subcommittee, I thank you for the opportunity to be here and testify. I will abbreviate my remarks as I go in the interest of time.

I especially want to make the point that the NNSA has committed to strategically modernizing our nuclear weapons infrastructure, the nuclear weapons systems themselves, and the supporting science, all of which are required to ensure a safe, secure, and effective nuclear deterrent, and to continue to certify the stockpile without underground testing, as we have now done for 20 years in a row.

Within today's constrained fiscal environment, we have also closely scrutinized our strategies, plans, processes, and organization to ensure we make the most of our resources. Over the past year, we have worked very closely between NNSA and DOD, often through the Nuclear Weapons Council and the subordinate bodies. We have been engaged in a budget-driven requirements analysis, and this process of rigorous analysis has forged a stronger link between the two agencies, as well as improved the thought process and the ideas that we are bringing forward for execution.

As a result, some of the highlights are we have achieved a comprehensive strategy for the conduct of LEPs across the stockpile. This has not existed before. We call this a 3+2 strategy. I will elaborate on that in just a few moments quickly.

We have updated and have now a more complete plutonium strategy, as Administrator Miller just went through.

We have a refocusing of our science, technology, engineering, and infrastructure activities underway right now and are continuing to make sure that we align those activities with the needs of the LEP for the capabilities that are most urgently needed.

We have done a reorganization of the way in which we operate our facilities accounts. The operations of facility accounts now are separated into site infrastructure, which is broad, and nuclear programs, which is specific to nuclear programs.

We as well have a sizeable challenge on our hands, the significant effort to identify and implement management efficiencies, specifically $320 million in amount in fiscal year 2014, building to $2 billion over the future years 2014 to 2018 Nuclear Security Program (NSP). Each of these critical areas was determined after a considerable and deep effort, again, among the agencies with which we work.

So let me for a moment touch on a few elements pertinent to this discussion and questions you might have.

The 3+2 strategy is a strategy that will provide, in the course of time, three interoperable ballistic missile systems to replace the four not interoperable ballistic systems we have today and two legs of the deterrent. In addition, we will have two interoperable systems covering the air-delivered leg. That will include at least a bomb system and a cruise missile system.

With regard to the LEPs, a very quick status is the W76 LEP has achieved the full build rate of production. We are in steady state, or phase 6, and that effort will complete with all deliveries required for the Navy now by the end of 2019.

The W88 Alt 370 is a substantial update on the arming, fuzing, and firing (AF&F) needed for the W88 weapons system. It is also in engineering development at phase 6–3, and it is slated for a first production unit also in fiscal year 2019.

The B61–12 is now also in engineering development, continuing very well. We are pursuing option 3B. That was a decision made by the Nuclear Weapons Council. That has, again, a first production unit of fiscal year 2019 and an initial baseline remaining at about $7.9 billion.

Very quickly, what I would like to address is there has been significant discussion of other options which were duly considered by the Nuclear Weapons Council and one that is attractive because of its lower cost. Triple Alt is an alteration of three specific components. While that would carry the B61 family forward for a few years and maybe as long as a decade, it would then need to be followed by a comprehensive LEP under greater urgency. That would not lead to a consolidation of the four different mods we have in this weapons system, and most importantly, it would not address some of the things like electronics degradation and the environment of the weapon, which the laboratories and laboratory directors are now seeing and are concerned about.

The last item I would like to mention is the first interoperable system. We denote it as the W78/88–1. That is in phase 6–2. It is in design definition and the cost study phase, which is going through right now assessment of really the ability for us to have an interoperable system in two legs of the deterrent.

Although I have other remarks, I think I will stop at this point and open the way for my colleagues for a time and questions later.

Senator UDALL. Thank you, Dr. Cook.

Admiral Richardson, welcome.

STATEMENT OF ADM JOHN M. RICHARDSON, USN, DEPUTY ADMINISTRATOR FOR NAVAL REACTORS, NATIONAL NUCLEAR SECURITY ADMINISTRATION, DEPARTMENT OF ENERGY

Admiral RICHARDSON. Chairman Udall, members of the subcommittee, thank you for the opportunity to testify before you today on the Naval Reactors fiscal year 2014 budget request. It is a privilege to be here representing the men and women of the Naval Nuclear Propulsion Program. This is the first of, hopefully, many times testifying as the Director. I am eager to share our progress, opportunities, and challenges.

Your Naval Nuclear Propulsion Program provides for research, development, design, procurement, certification, operation, and eventual disposal of 97 naval nuclear reactors that power the 10

aircraft carriers, 14 *Ohio*-class ballistic missile submarines, 4 guided missile submarines, and 54 attack submarines, more than 40 percent of the U.S. Navy's major combatants. These ships are available whenever called to go anywhere in the world and remain continuously on station in defense of our Nation's interests.

Mr. Chairman, my budget request for fiscal year 2014 is $1.26 billion and includes funds for my base program, as well as for three new projects, the replacement of the *Ohio*-class submarine, a refueling overhaul for our land-based prototype, and the recapitalization of our spent fuel handling facility in Idaho. The requested funding in fiscal year 2014 and the out-years has been vetted by OMB, DOE, and NNSA. In addition, the Office of the Secretary of Defense (OSD) CAPE recently completed a comprehensive analysis of the program and validated our requirements.

With your permission, sir, I would like to quickly share a few details about the activities funded by our request.

First, the *Ohio*-class strategic deterrent submarines will begin to reach the end of their service life in the late 2020s. The fiscal year 2014 request includes $126 million for the development of the reactor plant for the submarine that will replace the *Ohio*-class. This new reactor plant includes a core that will last the entire life of the submarine, 42 years, without needing to be refueled. The life-of-the-ship core, coupled with other maintenance innovations, enables this new ballistic missile submarine (SSBN) force to eliminate the mid-life refueling, turning shipyard time into at-sea time, and by virtue of the increased operational availability made possible by this core, the new SSBN class is able to meet its strategic commitments with 12 ships, 2 less than the current force of 14. The Navy estimates this will save $40 billion over the life of the program. The procurement of the first *Ohio* replacement submarine is scheduled in 2021 with nuclear component procurement beginning in 2019.

The second project in our request is the refueling and overhaul of the land-based prototype reactor, which begins in 2018. To support this requirement, the fiscal year 2014 budget request includes $144 million. This program is essential to delivering the life-of-the-ship core for the new strategic submarine. When we refuel this reactor, the core we will use will include advanced features that we intend to use for the submarine reactor. Fielding a prototype with this advanced core will allow us to validate the manufacturing techniques and better understand the behavior of this core for the *Ohio* replacement. This understanding will translate into reduced technical costs and schedule risk to this new submarine.

We also use this reactor to train our fleet operators, about 800 a year. So in addition to the technology linked to the new submarine, this refueling will allow us to continue that critical training for an additional 20 years.

The final project in our budget supports the Navy's refueling scheduled for the *Nimitz*-class aircraft carriers. The fiscal year 2014 budget includes $70 million to complete conceptual design and begin project engineering and design for the new facility to handle that spent fuel from those carriers. This new spent fuel handling project will come on line in 2022 to replace the existing facility, which is more than 50 years old and is quickly becoming

obsolete. The new facility will also enable me to meet my commitments to the State of Idaho which require that naval spent nuclear fuel be moved to dry storage and ultimately to permanent disposal.

Finally, Mr. Chairman, everything I do, including these three projects I have just described, are made possible only by the efforts of the talented and dedicated people in my two labs and my headquarters personnel. These people form the base of my program. These scientists and engineers provide the technical foundation that is essential for me to execute my day-to-day regulatory and fleet support responsibilities for the 97 reactors currently in service, the shipyards that maintain the nuclear powered fleet, and the vendors that supply that fleet. This core talent base also does the design analysis and oversight work for these new projects and manages our spent fuel to ensure we meet our responsibilities to the American people and the environment.

I am grateful for the support this committee has given the Naval Nuclear Propulsion Program. I look forward to working together to advance the three critical projects discussed today and support the safe operation of the nuclear powered fleet. Thank you again. I am ready to answer any questions, sir.

Senator UDALL. Thank you, Admiral.

Mr. Huizenga?

STATEMENT OF MR. DAVID G. HUIZENGA, SENIOR ADVISOR FOR ENVIRONMENTAL MANAGEMENT, OFFICE OF ENVIRONMENTAL MANAGEMENT, DEPARTMENT OF ENERGY

Mr. HUIZENGA. Good afternoon, Chairman Udall and members of the subcommittee. I am honored to be here today to discuss the many positive things the OEM is doing for the Nation and to address your questions on our fiscal year 2014 budget request.

Finally, I will just offer my appreciation for so quickly approving a reprogramming request that recently came up. I appreciate that.

Our request of $5.3 billion for defense-funded activities will enable our office to continue the safe cleanup of the environmental legacy brought about from 5 decades of nuclear weapons development and Government-sponsored nuclear energy research. Our cleanup priorities are based on risk and our continued effort to meet our regulatory compliance commitments. Completing cleanup enables other crucial DOE missions to continue and ensures the reduction of one of the U.S. Government's largest liabilities.

The OEM has made significant progress in accelerating cleanup across the United States. For example, in 2009, the total footprint of EM's cleanup sites was 931 square miles. As of January of this year, that figure has been reduced by 74 percent. In 2012 at the Savannah River Site (SRS) in South Carolina, EM achieved a key milestone with closure of two high-level waste tanks. Also to date, EM has sent more than 11,000 shipments of transuranic (TRU) waste to the Waste Isolation Pilot Plant (WIPP) in New Mexico for safe disposal.

These accomplishments have been possible due to our competent Federal and contractor workforce. The safety of these workers is a core value that is incorporated into every aspect of our program. We maintain a strong safety record and continuously strive for an accident- and incident-free workplace by aggressively sharing les-

sons learned across our sites. We are training senior management and working to achieve an even stronger safety culture within our program, thereby ensuring safe construction and operation of our facilities.

In recognition of EM's improvements in contract and project management, earlier this year my colleague, Mr. Trimble, to my left, and his colleagues removed EM capital asset projects with values less than $750 million from its high-risk designation. We are deeply committed to excellence in contract management and project management, and as much as I enjoy working with Dave, we intend to keep these projects off the GAO high-risk list.

In fiscal year 2014, we are positioned to continue making progress toward our cleanup goals. For example, at the Office of River Protection, we are continuing construction of the low activity waste facility, complete construction of the analytical laboratory, and continue to see tank farm retrievals. At the SRS, we will close another two tanks, tanks 5 and 6, high-level waste tanks. At Idaho, we are going to continue progress on the treatment of the remaining 900,000 gallons of liquid waste and process and ship 4,500 cubic meters of transuranic (TRU) waste to WIPP. At Los Alamos, we are going to continue to focus on processing and removing 3,700 cubic meters of above-ground TRU waste. Finally, we are going to continue disposition of the U–233 inventory from Oak Ridge National Laboratory and pursue technology development for cost-effective treatment of mercury contaminated building debris at Y–12.

In closing, we will continue to apply innovative cleanup strategies so that we can complete our work safely on schedule and within cost, demonstrating a solid value to the American taxpayers. The OEM has made steady progress, and with your help, we will continue to do so.

Thank you and I, as the others, will take questions.

[The prepared statement of Mr. Huizenga follows:]

PREPARED STATEMENT BY MR. DAVID HUIZENGA

Good afternoon, Mr. Chairman, Ranking Member Sessions, and members of the subcommittee. I am pleased to be here today to represent the Department of Energy's (DOE) Office of Environmental Management (EM). I would like to provide the Members with an overview of the EM program, key accomplishments during the past year, 2013 planned accomplishments and progress to date, the projected impacts of sequestration, and planned accomplishments under the fiscal year 2014 request.

OVERVIEW OF THE EM MISSION

EM's mission is to complete the safe cleanup of the environmental legacy resulting from five decades of nuclear weapons development and government-sponsored nuclear energy research. This environmental legacy includes 88 million gallons of some of the world's most dangerous radioactive wastes, thousands of tons of spent nuclear fuel (SNF), over 10,000 containers of excess plutonium and uranium, over 5,000 contaminated facilities, millions of cubic meters of contaminated soil and billions of gallons of contaminated groundwater. As the largest environmental cleanup program in the world, EM was charged with the responsibility of cleaning up 107 sites across the country; an area equal to Rhode Island and Delaware combined. EM has made significant progress in this cleanup mission, completing the cleanup work at 90 of the 107 sites through the end of 2012.

EM CLEANUP OBJECTIVES

EM continues to pursue its cleanup objectives safely within a framework of nuclear safety orders, environmental regulatory compliance commitments and best

business practices. The rationale for cleanup prioritization is based on achieving the highest risk reduction benefit per radioactive content (activities focused on materials and wastes that contain the highest concentrations of radionuclides and sites with the highest radionuclide contamination). Taking many variables into account, EM has generally prioritized its cleanup activities across the EM complex as follows:

- Safety, security, and quality
- Environmental Compliance
- Radioactive tank waste stabilization, treatment, and disposal
- Spent (used) nuclear fuel storage, receipt, and disposition
- Special nuclear material consolidation, stabilization, and disposition
- High-risk soil and groundwater remediation
- Transuranic and mixed/low-level waste disposition
- Soil and groundwater remediation
- Excess facilities deactivation and decommissioning.

In addition to these priorities, EM is committed to sound technology development and deployment as a way to reduce costs and fulfill its critical mission. EM develops and implements first-of-a-kind technologies to further enhance its ability and efficiency in cleaning up radioactive waste. Through these innovations, EM and the companies that perform its cleanup work have remained world leaders in this arena. EM's work enables other crucial DOE missions to continue across the United States. For example, EM supports the non-proliferation mission of the Department by providing and managing receipts of foreign and domestic research reactor fuels from around the world. EM supports both Science and National Nuclear Security Administration national laboratories by managing and dispositioning wastes and remediating and removing old facilities, enabling the Department to develop new capabilities. Finally, EM has consolidated nuclear materials from around the complex, reducing security requirements at a number of labs and former weapons production sites. By reducing EM's cleanup footprint, EM is lowering the cost of security, surveillance, infrastructure, and overhead costs that would otherwise continue for years to come.

Additional strategies are integrated into cleanup activities that are important to the achievement of EM cleanup progress as well as the stakeholders and states where cleanup sites are located. These strategies include development of technologies that can improve the efficiency and effectiveness of the cleanup activity, better use of contract types, options and alternatives for specific cleanup activities, and integration/optimization of shipping to disposal facilities to reduce costs. Most importantly, EM will continue to discharge its responsibilities by conducting cleanup within a "Safe Performance of Work" culture that integrates environmental, safety, health, and quality requirements and controls into all work activities. This ensures protection to the workers, public, and the environment.

KEY ACCOMPLISHMENTS IN THE PAST YEAR

I would like to take this opportunity to highlight a number of the Office of Environmental Management's most recent accomplishments.

Continuous Improvement in Integrated Safety Management

One of my highest areas of emphasis has been in leading improvements to the organizational, safety, and security culture of EM. An organization's culture directly impacts how the organization performs. For industrial organizations, and particularly for nuclear organizations, having a strong safety and security culture is imperative for ensuring the safe and secure performance of high-quality work. It must be a fundamental value shared by all members of the organization at all levels.

In 2011, DOE accepted the Defense Nuclear Facilities Safety Board recommendation to strengthen the safety culture at the Waste Treatment and Immobilization Plant in Hanford. Recognizing the importance of this initiative we have expanded our scope to improve safety culture at all of our EM sites. Efforts in this area are ongoing, and we have trained over 1,000 senior Federal and contractor managers on Leadership for a Safety Conscious Work Environment. Early indications are that we are seeing a clear recognition by managers of the need to improve the communication of expectations that flow throughout our sites and headquarters. We have also continued to improve our safety and security culture through other ongoing initiatives such as evaluating field site safety management, sharing safety lessons learned and best practices, and working to improve our security and quality assurance programs across all of EM.

Part of maintaining a strong organizational culture is embracing the concepts of continuous improvement and fostering a learning and questioning organization. While EM is focusing on efforts to improve our culture and is seeing success through

our interactions with our leadership and employees at our sites, there is more work to be done, and this will continue to be a key area of focus for EM.

Project and Contract Management

A second area of emphasis has been the improvement of project and contract management. EM's project and contract management has long been designated a governmental "high risk area" by the Government Accountability Office (GAO). Key EM reforms in this area include implementing policies requiring more front-end planning; ensuring Federal project directors and contracting officers have access to relevant training to help enhance their project and contract management knowledge; improving cost estimating; conducting more frequent project reviews by peers and experts in project management to ensure issues are identified early and lessons learned are being applied in real-time; selecting proper contract types; tying fee strategies to final outcomes; and restructuring our portfolio into smaller, better defined capital asset projects and non-capital operations activities.

These reforms are already bearing fruit. On February 14, 2013, GAO issued its biennial update to the high risk list. In recognition of EM's improvements in contract and project management, GAO narrowed the scope of its high risk designation, focusing on EM capital asset projects with costs greater than $750 million. In the report, GAO recognized EM management for demonstrating "strong commitment and top leadership support for improving contract and project management." EM will continue the specific project and contract management reforms above.

The Office of Environmental Management is continuing to make progress on constructing EM's two largest projects—the Waste Treatment and Immobilization Plant (WTP) in Richland, WA, and the Salt Waste Processing Facility in Aiken, SC.

The WTP will treat and immobilize in glass the bulk of approximately 56 million gallons of radioactive waste stored in 177 underground storage tanks at the Hanford site. We have encountered several technical and management issues at the Pretreatment Facility and the High-Level Waste Facility and are working expeditiously to address them. Full construction continues on the Low-Activity Waste Facility, Analytical Laboratory and the Balance of Facilities (support facilities). The Department has determined to ramp-up construction activities in the High-Level Waste Facility in areas not impacted by technical issues.

Over the last several months, the former Energy Secretary and a number of top scientists and engineers reviewed many aspects of the WTP. Approaches are being evaluated to resolve the issues associated with criticality, hydrogen generation, erosion/corrosion, and tank mixing issues. Technical teams developed as a result of this review draw upon expertise from academia, industry, and the Department's national laboratories.

EM's second largest construction project, the Salt Waste Processing Facility (SWPF), will treat the salt portion of the liquid radioactive waste inventory at the Savannah River Site. This project and is 69 percent complete. A pilot version of the treatment plant has been operating successfully since 2008, providing high confidence in the technical capabilities of SWPF. To date, the pilot plant has processed over 3 million gallons of tank waste. Due to delays in the delivery of key facility components meeting acceptable quality levels for nuclear facilities, including mixing vessels, SWPF is experiencing cost over-runs and schedule delays. Since the delivery of the mixing vessels last year, we are working closely with our contractor to identify the most economical and timely path for completion.

Finally, I would like to provide an update on a third important EM construction project. The Integrated Waste Treatment Unit (more commonly known as the Sodium Bearing Waste project) will treat 900,000 gallons of radioactive liquid waste stored in underground tanks at the Idaho National Laboratory. Following the completion of construction, the facility began startup testing. However, startup testing was suspended in June 2012 to allow detailed evaluation of a system pressure event that occurred during cold commissioning. EM is planning to resume facility startup operations in early 2014.

Each of these three construction projects involve the processing, treatment and immobilizing high level radioactive/hazardous waste into glass or solid carbonate. These projects have been especially challenging considering these are first-of-a-kind and one-of-a-kind facilities.

Cleanup Progress

Thanks in part to the improvements in integrated safety management, contract management, and project management, EM has achieved major cleanup successes:

- Footprint Reduction. In 2009, the total footprint of EM's cleanup sites was 931 square miles. Through January 2013, we have reduced that figure

by 74 percent, primarily through the use of Recovery Act funding to complete the cleanup of large areas of the Hanford and Savannah River sites.
• High Level Radioactive Waste. We have also made significant progress in the treatment of high-level radioactive waste, which represents the most hazardous and costly component of EM's cleanup mission. At the Savannah River Site, in fiscal year 2012 we achieved closure of two high-level waste tanks—the first tanks closed at the site since 1997—and packaged a record high of 275 canisters of high level waste in a single year at the Defense Waste Processing Facility.
• Transuranic Waste. Finally, we continue to achieve major successes with our Nation-wide program for the transportation and disposition of transuranic waste. To date, we have sent more than 11,000 shipments of this waste to the Waste Isolation Pilot Plant in Carlsbad, NM, for disposal.

EM has achieved significant progress. However, I would also like to provide you an update on an issue that has emerged this year. In 2005, DOE completed a tank stabilization effort designed to remove much of the liquid waste from Hanford's single shell tanks. In February, DOE found that one tank continues to leak and five other tanks are showing declining liquid level trends that may indicate leaking. Video examination of the interior of the tanks is planned in the coming months. Both the Department of Energy and the Washington State Department of Ecology agree that the leaks pose no immediate health threat. Safe storage of tank waste until it is treated for permanent disposal is a top priority, and EM is working to further investigate the issue and evaluate appropriate corrective actions.

HIGHLIGHTS OF THE FISCAL YEAR 2014 BUDGET REQUEST

The fiscal year 2014 EM budget request totals $5.621 billion, which is $88.7 million less than the fiscal year 2012 current enacted amount. The request includes a $463 million net neutral transfer from Defense Environmental Cleanup to the Uranium Enrichment Decontamination and Decommissioning Fund for the Budget proposal to reauthorize the Fund. The request funds Defense Environmental Cleanup activities at $5.317 billion for fiscal year 2014. Examples of planned activities and milestones for fiscal year 2014 by site-specific categories are:

IDAHO NATIONAL LABORATORY, ID

[In thousands of dollars]

Fiscal Year 2012	Fiscal Year 2014 Request
$384,669	$365,010

Key Accomplishments Planned for Fiscal Year 2014

• Process and ship approximately 4,500 cubic meters of contact-handled TRU Waste to the Waste Isolation Pilot Plant.
• Continue sodium-bearing waste treatment operations.
• Maintain tank farm and systems for delivery of sodium bearing waste until treatment is complete.

LOS ALAMOS NATIONAL LABORATORY, NM

[In thousands of dollars]

Fiscal Year 2012	Fiscal Year 2014 Request
$188,161	$219,789

Key Accomplishments Planned for Fiscal Year 2014

• Support process towards completion of processing and removal of 3,706 cubic meters of above-ground TRU waste (June 2014 milestone).
• Continue groundwater and remediation activities.
• Continue operation of new oversize modular box line and disposition of excess materials and TRU waste.
• Continue disposition of mixed low-level waste/low-level waste.
• Support decontamination, decommissioning and demolition activities for process-contaminated facilities at Technical Area-21.

OAK RIDGE RESERVATION, TN

[In thousands of dollars]
[Includes Safeguards & Security Funding]

Fiscal Year 2012	Fiscal Year 2014 Request
$218,902	$216,827

Key Accomplishments Planned for Fiscal Year 2014

- Continue shipments of Consolidated Edison Uranium Solidification Project material from the uranium-233 inventory in Building 3019A to Nevada for disposal.
- Complete planning and readiness activities for processing the remaining uranium-233 inventory in Building 2026.
- Conduct a screening characterization of the West End Mercury Area of Y–12 National Security Complex to refine estimates of the nature and extent of mercury contamination and to identify areas that will require full characterization and mitigation measures.
- Continue operations of liquid, gaseous and process waste systems at Oak Ridge National Laboratory.
- Continue Sludge Disposition Build-out Project Design at TRU Waste Processing Center for sludge stabilization.
- Continue transfers of transuranic waste to the Transuranic Waste Processing Center located at the Oak Ridge National Laboratory.
- Continue processing and disposal of contact-handled and remote-handled transuranic waste.

RICHLAND SITE, WA

[In thousands of dollars]
[Includes Safeguards & Security Funding]

Fiscal Year 2012	Fiscal Year 2014 Request
$1,019,121	$990,863

Key Accomplishments Planned for Fiscal Year 2014

- Continue remediation of the 618–10 burial ground and continue remediation of other waste sites along the Columbia River.
- Initiate deactivation, decontamination, decommissioning and demolition of the high-risk Building 324 and the remediation of soil underneath.
- Continue deactivation and decommissioning of facilities in the Plutonium Finishing Plant complex, including deactivating and preparing for dismantlement of the above grade portions of 234–5Z, 243–Z, and other facilities.
- Treat and dispose of liquid waste from site generators and dispose treated liquid effluents from the 200 Area Liquid Effluent Facility.

OFFICE OF RIVER PROTECTION, WA

[In thousands of dollars]

Fiscal Year 2012	Fiscal Year 2014 Request
$1,182,010	$1,210,216

Key Accomplishments Planned for Fiscal Year 2014

- Continue construction of Low Activity Waste, Laboratory, and Balance of Facilities and complete construction of Analytical Laboratory.
- Continue activities for the Design Completion Team to resolve WTP technical issues and align the preliminary documented safety analysis with the design to allow for resumption of HLW construction in all areas of the facility by the end of 2014.
- Continue single shell tank retrieval activities in order to complete all C Farm retrievals by the end of 2014.
- Continue AY/AZ Farm ventilation system upgrades and Feed Delivery System activities.

SAVANNAH RIVER SITE, SC

[In thousands of dollars]
[Includes Safeguards & Security Funding]

Fiscal Year 2012	Fiscal Year 2014 Request
$1,316,922	$1,209,457

Key Accomplishments Planned for Fiscal Year 2014

- Produce 100 canisters at the Defense Waste Processing Facility.
- Continue closure activities for Tanks 5 and 6.
- Process 3 million gallons of salt tank waste and dispose over 5 million gallons of low-activity waste onsite in the Saltstone Disposal Units.
- Continue construction of the Salt Waste Processing Facility.
- Continue receipt of Foreign/Domestic Research Reactor Used Nuclear Fuel and implement Augmented Monitoring and Condition Assessment Program of Used Nuclear Fuel in wet storage.
- Store and ship non-Moxable plutonium to the Waste Isolation Pilot Plant.
- Continue processing of low-level and mixed low-level radioactive waste and disposal operations in E Area.
- Continue Building 235–F Risk Reduction scope to meet Implementation Plan for Defense Nuclear Facilities Safety Board's Recommendation 2012–1.

WASTE ISOLATION PILOT PLANT, NM

[In thousands of dollars]
[Includes Safeguards & Security Funding]

Fiscal Year 2012	Fiscal Year 2014 Request
$218,179	$208,367

Key Accomplishments Planned for Fiscal Year 2014

- Support transport and disposal of remote-handled and contact-handled TRU waste at the Waste Isolation Pilot Plant. . Continue Central Characterization Project for TRU waste at Los Alamos National Laboratory, Idaho National Laboratory and Oak Ridge National Laboratory. . Maintain capability for receipt and disposal for up to 21 shipments per week of contact-handled and remote-handled TRU for 41 weeks.

CONCLUSION

Mr. Chairman, Ranking Member Sessions, and members of the subcommittee, I am honored to be here today representing the Office of Environmental Management. EM is committed to achieving its mission and will continue to apply innovative environmental cleanup strategies to complete work safely, on schedule, and within cost thereby demonstrating value to the American taxpayers. I am pleased to answer any questions you may have.

Senator UDALL. Thank you, Mr. Huizenga. I think you put your finger on it. I think at some level the GAO's mission is to put themselves out of business. So anything you can do to make that a possibility, I am sure they would appreciate it.

Mr. Trimble?

STATEMENT OF MR. DAVID C. TRIMBLE, DIRECTOR, NATIONAL RESOURCES AND ENVIRONMENT, GOVERNMENT ACCOUNTABILITY OFFICE

Mr. TRIMBLE. Thank you. Chairman Udall and members of the subcommittee, my testimony today will focus on our recent and ongoing work on cost estimating practices and budgetary information at NNSA and EM for projects and programs.

While DOE has taken a number of steps to improve its management of projects, all of the ongoing major projects continue to experience significant cost increases and schedule delays. Uranium Processing Facility costs have increased seven-fold up to $6.5 billion for a project with reduced scope and 11 years added to the schedule. CMRR costs have increased nearly six-fold up to $5.8 billion with a total delay, counting the deferral announced last year, of up to 12 years. The Waste Treatment and Immobilization Plant has tripled in cost over $12 billion with a decade added to its schedule.

Regarding cost estimating, our preliminary observations from ongoing work we are doing for this committee include the following. DOE has not established a cost estimating policy for capital projects. DOE's project management order does not meet cost estimating best practices. NNSA and DOE cost estimating guidance does not fully meet GAO's best practices criteria for cost estimating.

While capital asset projects are highly visible, about 90 percent of NNSA's budget is devoted to operating programs. Our preliminary findings examining cost estimating practices for programs indicate that DOE and NNSA may lack specific cost estimating requirements or guidance for programs. For example, NNSA officials responsible for the Plutonium Disposition Program told us that they have constructed a life cycle cost estimate of about $24 billion for the program. They noted, however, that there is no DOE or NNSA requirement prescribing how such an estimate should be developed, nor is there a requirement that it be independently reviewed.

In regard to budgetary information, in June 2010, we examined NNSA's program to operate and maintain weapons facilities and infrastructure and found that NNSA could not accurately identify the total cost for this congressionally directed program. NNSA's budget justification understated these costs by over $500 million.

In July 2012, we found deficiencies in NNSA's validation of budget requests for its programs and concluded that these weaknesses impacted the credibility and reliability of those budget estimates. According to NNSA officials, the agency's experience and trust in these contractors minimized the need for such review.

In closing, let me note that without accurate cost and budget information, DOE is not in a position to effectively manage the critical projects and programs carried out by its contractors. With over $180 billion planned to be spent at NNSA alone over the next 18 years, Congress also needs accurate and reliable information on these costs as it confronts difficult budgetary decisions. Without improvements in this information and DOE's capabilities to use and effectively apply this information, DOE will continue to be surprised by cost and schedule problems and will continue to be forced to manage these problems through reactive and stop gap measures such as suspending programs, reducing the scope of critical projects, or robbing Peter to pay Paul.

Thank you. I am happy to answer any questions.

[The prepared statement of Mr. Trimble follows:]

PREPARED STATEMENT BY MR. DAVID TRIMBLE

Chairman Udall, Ranking Member Sessions, and members of the subcommittee: Thank you for the opportunity to discuss our work on project and program cost estimating and related budget information in the National Nuclear Security Administration (NNSA), a separately organized agency within the Department of Energy (DOE), and DOE's Office of Environmental Management (EM). In fiscal year 2012, NNSA and EM received appropriations of over $16 billion to ensure the safety, security, and reliability of the U.S. nuclear weapons stockpile and to address the environmental cleanup of Cold War sites. Together, NNSA and EM have outlined plans that could commit American taxpayers to $450 billion in programs and projects over decades to address their missions. Specifically, in 2011, NNSA put forward plans to modernize the U.S. nuclear security enterprise at a cost of $88 billion over the next decade and a total cost of over $180 billion to do so through 2031.[1] In 2012, DOE estimated that its total liability for environmental cleanup, the largest component of which is managed by EM, is almost $270 billion and includes responsibilities that could continue beyond the year 2087.[2] In a time of fiscal constraint, Congress needs high-quality cost and budget information upon which to make decisions about NNSA's and EM's projects and programs. Our recent and ongoing work on cost estimating, budget validation, and program expenditures highlight some of the challenges Congress faces in getting reliable and accurate cost information from NNSA and EM that it can use to make cost-informed decisions and effectively conduct oversight.[3]

NNSA and EM oversee contracts for the execution of both projects, including capital asset acquisitions, and programs central to the achievement of their missions. DOE defines a capital asset acquisition project as having a defined start and end point with a cost that includes both purchase price and all other costs incurred to bring it to a form and location suitable for its intended use. Capital asset project costs exclude operating expenses that are part of routine operations and maintenance functions. Examples of ongoing DOE capital asset projects include NNSA's Uranium Processing Facility at the Y–12 National Security Complex in Tennessee—currently estimated to cost up to $6.5 billion—and EM's Waste Treatment and Immobilization Plant in Washington, currently estimated to cost $13.4 billion. While capital asset projects are a visible part of DOE's budget, these projects comprise a relatively small portion of the total budget. In fiscal year 2012, capital asset projects comprised just under 10 percent of NNSA's budget, and approximately 90 percent of that budget was for operating programs. DOE defines a program as an organized set of activities directed toward a common purpose or goal and characterized by a strategy for accomplishing one or more definite objectives. A program includes routine operations and maintenance costs and can include projects in its scope. An example of an ongoing program is NNSA's Tritium Readiness Program—a program to produce a steady supply of tritium, a key isotope used in nuclear weapons—that has had an annual funding requirement of about $70 million.

For NNSA, work activities on both projects and programs are largely carried out by management and operating (M&O) contractors at NNSA's eight government-owned, contractor-operated sites.[4] For EM, with a remaining environmental cleanup mission covering 17 sites in 11 States, cleanup work activities are carried out by

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[1] U.S. Department of Energy, Fiscal Year 2012 Stockpile Stewardship and Management Plan (Washington, DC: Apr. 15, 2011).

[2] U.S. Department of Energy, Fiscal Year 2012 Agency Financial Report, DOE/CF–0081 (Washington, DC: Nov. 14, 2012).

[3] See, for example, GAO, Department of Energy: Actions Needed to Develop High-Quality Cost Estimates for Construction and Environmental Cleanup Projects, GAO–10–199 (Washington, DC: Jan. 14, 2010); GAO, Nuclear Weapons: Actions Needed to Identify Total Costs of Weapons Complex Infrastructure and Research and Production Capabilities,GAO–10–582 (Washington, DC: June 21, 2010); and GAO, Modernizing the Nuclear Security Enterprise: NNSA's Reviews of Budget Estimates and Decisions on Resource Trade-offs Need Strengthening, GAO–12–806 (Washington, DC: July 31, 2012).

[4] M&O contracts are agreements under which the Federal Government contracts for the operation, maintenance, or support, on its behalf, of a government-owned or -controlled research, development, special production, or testing establishment wholly or principally devoted to one or more of the major programs of the contracting Federal agency. Federal Acquisition Regulation, 48 C.F.R. § 17.601. Specifically, NNSA manages three national nuclear weapons design laboratories—Lawrence Livermore National Laboratory in California, Los Alamos National Laboratory in New Mexico, and Sandia National Laboratories in New Mexico and California. It also manages four nuclear weapons production plants—the Pantex Plant in Texas, the Y–12 National Security Complex in Tennessee, the Kansas City Plant in Missouri, and the Tritium Extraction Facility at DOE's Savannah River Site in South Carolina. NNSA also manages the Nevada National Security Site, formerly known as the Nevada Test Site.

contractors as projects, such as by Washington River Protection Solutions for the operation of nuclear waste tanks at the Hanford Site in Washington.

For decades, we have reported on the status of DOE's major projects (i.e., those costing $750 million or more) and programs and have repeatedly identified project cost overruns and schedule delays, as well as missed programmatic milestones. For example, in November 1996, we reported that, as of June 1996, most of DOE's completed major projects and at least half of its 34 ongoing projects were experiencing cost overruns and/or schedule delays.[5] Thirteen years later in March 2009, we testified that DOE had added nearly $14 billion and 45 years to its initial cost and schedule estimates of then ongoing construction projects, and it added an additional $25 billion to $42 billion and an additional 68 to 111 years to initial cost and schedule estimates of ongoing environmental cleanup projects.[6] Further, in our March 2009 report, we found that NNSA was able to meet its refurbishment schedule for a life extension program only by changing the objectives of the program and, among other things, reducing the number of refurbishments needed for program completion.[7] In February of this year, NNSA and EM were again included on GAO's High-Risk List in recognition of the potential for vulnerabilities to fraud, waste, abuse, and mismanagement in contract administration and management of major projects.[8]

In 2008, DOE completed an effort to document its contract and project management challenges, which involved identifying issues that significantly impeded the department's ability to complete projects within budget and on schedule. DOE undertook this exercise—known as a root-cause analysis—as part of its effort to be removed from our list of agencies at high risk for fraud, waste, abuse, and mismanagement. The top contract and project management issue identified in that root-cause analysis was that DOE often does not complete front-end planning to an appropriate level before establishing a project's performance baseline—a project's cost, schedule, and scope—including for cost estimates and budget planning. According to cost estimating best practices compiled in our March 2009 Cost Estimating and Assessment Guide,[9] the most rigorous method reviewers have in validating a project's cost estimate is the independent cost estimate. Generated by an entity that has no stake in the approval of a project, an independent cost estimate provides an independent validation of expected project costs, according to our cost-estimating guide. An independent cost estimate is usually developed based on the same technical parameters as the project team's estimate, so the estimates are comparable. Conducting an independent cost estimate is especially important at major milestones because it provides senior decisionmakers with a more objective assessment of the likely cost of a project. In mid-2008, DOE adopted a corrective action plan designed to mitigate the issues identified in the root-cause analysis. The corrective action plan included a set of actions designed to establish and implement a "Federal independent government cost estimating capability" to address the issues it identified related to cost estimating.

Since that time, DOE has taken steps to improve the cost-estimating aspects of contract and project management in NNSA and EM, but weaknesses persist. In a time of fiscal constraint, Congress needs high-quality cost information upon which to make decisions about NNSA's and EM's projects and programs. A realistic cost estimate provides a basis for accurate budgeting and effective resource allocation, which increases the probability of a project's or program's success in meeting its goals. My testimony today is based primarily on reports we issued from January 2010 to February 2013. Specifically, I will focus my testimony on: (1) our prior find-

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[5] GAO, Department of Energy: Opportunity to Improve Management of Major System Acquisitions. GAO/RCED–97–17 (Washington, DC: Nov. 26, 1996).

[6] GAO, Department of Energy: Contract and Project Management Concerns at the National Nuclear Security Administration and Office of Environmental Management, GAO–09–406T (Washington, DC: Mar. 4, 2009).

[7] The end of the Cold War caused a dramatic shift in how the Nation maintains nuclear weapons. Instead of designing, testing, and producing new nuclear weapons, the strategy shifted to maintaining the existing nuclear weapons stockpile indefinitely. Life extension programs extend, through refurbishment, the operational lives of weapons in the nuclear stockpile by 20 to 30 years and certify these weapons' military performance requirements without underground nuclear testing. NNSA is currently conducting life extension programs for multiple weapon types in the U.S. stockpile, including the Air Force's B61 gravity bomb. GAO, Nuclear Weapons: NNSA and DOD Need to More Effectively Manage the Stockpile Life Extension Program, GAO–09–385 (Washington, DC: Mar. 2, 2009).

[8] GAO, High-Risk Series: An Update,GAO–13–283 (Washington, DC: February 2013). In our 2013 High-Risk Update, we narrowed the focus of NNSA's and EM's high-risk designation to focus on major projects, those with individual values of $750 million or greater.

[9] The guide is a compilation of cost-estimating best practices drawn from across industry and government. GAO, GAO Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs, GAO–09–3SP (Washington, DC: March 2009).

ings on cost-estimating practices for NNSA's and EM's capital asset projects, as well as preliminary observations from our ongoing work for this subcommittee on NNSA cost-estimating practices for such projects; and (2) our prior findings on cost estimating and related budget information for NNSA's programs, as well as preliminary observations from our ongoing work for this subcommittee on NNSA's cost-estimating practices for such programs. Detailed information on our scope and methodology for our prior work can be found in these reports.

To develop our preliminary observations, we reviewed DOE and NNSA policies, orders, and guidance related to preparing and reviewing cost estimates, as well as past GAO reports. We interviewed DOE, NNSA, and contractor officials to discuss the requirements and guidance used to prepare and review these estimates. We are conducting our ongoing work 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. We obtained DOE's and NNSA's views on the new information in our testimony concerning our ongoing work on DOE's and NNSA's cost-estimating practices.

BACKGROUND

NNSA relies primarily on the requirements in DOE Order 413.3B for planning and executing projects, from identification of need through project completion.[10] This project management order requires, among other things, that cost estimates be established for these projects, and an independent review of these estimates be conducted for larger projects. For example, for projects with a total cost of greater than $100 million, DOE's Office of Acquisition and Project Management is required to validate the accuracy and completeness of a project's performance baseline, including its estimated cost, at certain important milestones. DOE's project management order establishes five major milestones—or "critical decision points"—that span the life of a project as follows:

- Milestone 0: Approve mission need.
- Milestone 1: Approve alternative selection and cost range. At this milestone, DOE completes the conceptual design, selects its preferred approach, and approves the project's preliminary cost range.
- Milestone 2: Approve the performance baseline—defined as a project's cost, schedule, and scope (the activities needed to achieve project goals). At this milestone, DOE completes its preliminary design and develops a definitive cost estimate, which is no longer a range. This cost estimate is to be used for establishing the project's funding profile throughout construction, and it informs annual budget requests.
- Milestone 3: Approve the start of construction.
- Milestone 4: Approve the start of operations or project completion.

DOE's project management order specifies the requirements that must be met for a project, along with the documentation necessary, to move past each project milestone; the order also requires that DOE senior management review the supporting documentation and approve the project at each milestone. DOE also provides suggested approaches for meeting the requirements contained in its project management order through additional guidance that is not mandatory. NNSA has supplemental requirements and guidance for establishing and reviewing project cost estimates, including requirements for conducting independent cost estimates, and a cost-estimating guide that provides additional suggestions on preparing and reviewing cost estimates.

With respect to operating programs, DOE Order 130.1 on program budget formulation—approved in 1995 and listed as current on DOE's website for Directives, Delegations, and Requirements—outlines the requirements for the department's annual budget formulation process, including that budget requests for operating programs "shall be based on cost estimates that have been fully reviewed and deemed reasonable" by the cognizant program organization. To this end, DOE's budget formulation order recognizes that operating programs' cost estimates bear a direct relationship to the future budget estimates for these programs. Further, consistent with Federal Accounting Standards Advisory Board guidance, NNSA is required to provide reliable and timely information on the full cost of its programs because this information is crucial for effective management of government operations and for budget over-

[10] DOE Order 413.3B, Program and Project Management for the Acquisition of Capital Assets, was issued in November 2010. It supersedes earlier DOE Orders 413.3A and 413.3.

sight.[11] To develop budget estimates for operating programs, NNSA is required under section 3252 of the National Defense Authorization Act for Fiscal Year 2000—the NNSA Act—to develop a planning, programming, and budgeting process that operates under sound financial and fiscal management principles.[12] Beginning in 2002, NNSA issued policies that identify the responsibilities of NNSA management, program and site offices, and contractors throughout the agency's budget cycle, including for validating programs' budget requests by reviewing aspects of cost estimating.[13] According to NNSA's policy, the cycle is composed of four phases—planning, programming, budgeting, and evaluation (PPBE)—and their associated activities, which together provide a framework for the agency to plan, prioritize, fund, and evaluate its program activities. While these phases appear to be sequential, the process is continuous and concurrent because of the amount of time required to develop priorities and review resource requirements.

- Planning. NNSA is to identify the goals it needs to achieve over the next 5 years and the program activities needed to meet those goals.
- Programming. NNSA is to determine which program activities and funding levels it will include in its next budget proposal to DOE. This determination is based on analysis of the activities' estimated costs, as well as the need to meet the NNSA goals defined in the planning process. To determine these activities, NNSA program offices are to work with their contractors to obtain estimates for the cost of the program activities identified in the planning phase.
- Budgeting. NNSA is to integrate its planning and programming priorities into DOE's departmental budget process by: (1) submitting its proposed budget to DOE and participating in a strategic review process; (2) validating its budget request by, in part, reviewing the cost-estimating practices used by the NNSA contractors and program offices; and (3) executing the budget and controlling funds to achieve the priorities established in the programming phase and maintain fiscal limits.
- Evaluation. NNSA is to employ an ongoing cycle of evaluations to review program performance.

Accurately identifying the activities necessary to conduct a program is a key aspect of PPBE's programming phase. NNSA documents the activities associated with a program, as well as the sites responsible for conducting these activities, in work breakdown structures—management tools used to identify the work activities that completely define a program. We published best practices for establishing work breakdown structures in our March 2009 cost-estimating guide.[14] Among other things, these best practices discuss establishing work breakdown structures that allow a program to track cost by defined deliverables, promote accountability by identifying work products that are independent of one another, and provide a basis for identifying resources and tasks for developing a program cost estimate. The ability to generate reliable cost estimates is a critical function, and a program's cost estimate is often used to establish its budgets.

OBSERVATIONS ON COST ESTIMATING PRACTICES FOR NNSA AND EM PROJECTS

For more than a decade, we have reported on the challenges NNSA and EM have faced in meeting their projects' cost performance targets as developed in cost estimates and for ensuring that the cost estimates developed are based on sound assumptions. In our most recent High-Risk Update, we reported that, as of August 2012, NNSA was managing three major projects with estimated costs totaling as much as $17.2 billion and that EM was managing seven major projects with estimated costs totaling as much as $48.5 billion.[15] We examined these 10 projects, but we were only able to analyze changes in cost estimates for 7 of them because of limitations in the data. For these seven projects, we determined that DOE has added as much as $16.5 billion to original cost estimates with further cost increases antici-

[11] Federal Accounting Standards Advisory Board, Statement of Federal Financial Accounting Standards No., 4, Managerial Cost Accounting Standards and Concepts (Washington, DC: July 31, 1995).

[12] NNSA was created by the National Defense Authorization Act for Fiscal Year 2000 (Pub. L. No. 106–65, § 3201 et seq. [1999]).

[13] See GAO, National Nuclear Security Administration: Additional Actions Needed to Improve Management of the Nation's Nuclear Programs, GAO–07–36 (Washington, DC: Jan. 19, 2007). In 2008, NNSA revised many of these policies and issued others in response to our findings in 2007 of deficiencies in how the agency ensures the validity of its budget estimates and how it decides to allocate its resources.

[14] GAO–09–3SP.

[15] GAO–13–283.

pated. While each of these projects has faced significant technical execution challenges, the extent of their cost growth as compared with project estimates calls into question the quality of those original estimates. For example:

- We reported in February 2011 that NNSA's project to design and construct a new Uranium Processing Facility at the Y–12 National Security Complex in Tennessee had experienced nearly sevenfold cost growth from its 2004 estimate to the current estimate of from $4.2 to $6.5 billion.[16] Since our February 2011 report, the facility is to be redesigned and enlarged to correct issues concerning processing equipment at an additional cost of $540 million, and the initial scope of the project has been significantly reduced. According to NNSA officials, the initial cost estimate for the Uranium Processing Facility, as well as subsequent revisions were based on an estimate to construct a less complex facility and assumed a funding profile where annual appropriations were not subject to budgetary constraints.
- We reported in March 2012 that NNSA's project to design and construct a new plutonium facility at Los Alamos National Laboratory in New Mexico had experienced a nearly sixfold increase from $3.7 billion to $5.8 billion before being deferred for at least 5 years.[17] We found that the facility's original design may not have met all of the mission needs identified.
- In December 2012, we reported that the estimated cost to construct EM's Waste Treatment and Immobilization Plant at the Hanford Site in Washington has tripled to $13.4 billion since its inception in 2000.[18] Significant technical challenges remain unresolved, contributing to uncertainty as to whether the project will operate safely and effectively.

DOE's approach to managing the work its contractors perform, including developing project cost estimates, has been a challenge for 30 years. In 1982, we reported that DOE did not have sufficient guidance to provide to its contractors for developing cost estimates.[19] DOE subsequently implemented a cost-estimating policy that increased oversight by, among other things, placing a headquarters-based office in charge of cost estimating and requiring it to conduct independent cost estimates. The policy also directed DOE to establish guidance that outlined procedures to be used by contractors when generating estimates and by DOE officials reviewing them. In the mid-1990s, however, as part of a governmentwide management reform movement, DOE rescinded its cost-estimating policy and replaced it with a less prescriptive one that did not contain specifics on cost estimating but rather focused on managing the life cycles of the department's physical assets.

In January 2010, we reported on DOE's project cost-estimating practices.[20] We found that DOE continued to lack a cost-estimating policy and that the cost-estimating guide it developed in the 1990s remained in effect.[21] We also found that the guide was out of date and did not contain important components. For example the guide assigned responsibilities to offices that no longer existed and was based on policies that had been canceled. In addition, we found that the guide did not contain sufficient information to help ensure that a cost estimator following the guide would successfully create a high-quality cost estimate. However, we also found that DOE was taking steps to improve its cost-estimating practices. For example, DOE established the Office of Cost Analysis (OCA) in 2008 to improve cost-estimating capabilities and better ensure that project cost estimates are reliable by providing a new independent cost-estimating capability.

Further, EM acted to place cost estimators at its large sites and establish an internal cost-estimating office capable of providing cost-estimating assistance primarily to its smaller sites. In addition, NNSA adopted a policy that, among other things, specified when independent cost estimates should be conducted. Our report recommended, among other things, that DOE issue a revised cost-estimating policy and updated guidance as soon as possible, requiring that an independent cost estimate be conducted for major projects at Milestones 1, 2, and 3. DOE generally concurred with the recommendations we made in this report but did not concur with conducting an independent cost estimate at all three of these milestones. Rather,

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[16] GAO, High-Risk Series: An Update. GAO–11–278 (Washington, DC: February 2011).

[17] GAO, Modernizing the Nuclear Security Enterprise: New Plutonium Facility at Los Alamos May Not Meet All Mission Needs,GAO–12–337 (Washington, DC: Mar. 26, 2012).

[18] GAO, Hanford Waste Treatment Plant: DOE Needs to Take Action to Resolve Technical and Management Challenges,GAO–13–38 (Washington, DC: Dec. 19, 2012).

[19] GAO, Further Improvements Needed in the Department of Energy for Estimating and Reporting Project Costs. GAO/MASAD–82–37 (Washington, DC: May 26, 1982).

[20] GAO–10–199.

[21] U.S. Department of Energy, Cost Estimating Guide, DOE G 430.1–1 (Washington, DC: Mar. 29, 1997).

at this time DOE explained that its new policy would require an independent cost estimate for Milestones 1 and 2, but not for Milestone 3 unless warranted by risk and performance indicators or required by senior officials.

We are conducting an ongoing review of the department's and NNSA's cost-estimating practices for this subcommittee. In particular, we are reviewing the extent to which NNSA's current cost estimating requirements and guidance for projects and programs align with cost-estimating best practices. Preliminary observations from our ongoing work indicate that departmental and NNSA cost-estimating practices for projects and programs need revision to align with cost-estimating best practices in our 2009 guide.[22] Our ongoing review, in many ways, picks up where our January 2010 report left off. After initially concurring with most of the recommendations we made in that report to improve the department's cost-estimating practices, DOE followed through on some of our recommendations, such as requiring an independent cost estimate for Milestone 2 for projects with a projected cost of $100 million or more; however, other actions appear to fall short of what is needed to ensure that DOE's cost-estimating practices fully adhere to best practices. Our ongoing work is focused on several aspects of DOE and NNSA's cost-estimating requirements and guidance, including the following:

- The department may have a continuing need for a cost-estimating policy. DOE has not established a cost-estimating policy. DOE's 2008 Root-Cause Analysis identified an insufficient independent cost-estimating capability as one of the top five reasons that DOE was unable to complete projects on cost and schedule. The analysis found that not having a cost-estimating policy was one of the root causes contributing to problems with cost estimating. DOE tasked OCA with, among other things, implementing actions to improve cost estimating within DOE, including reestablishing a cost-estimating policy and updating associated guidance. As we previously reported, having a cost-estimating policy would establish roles and responsibilities for those preparing, reviewing, and updating all types of cost estimates.[23] Such a policy would also identify when different cost estimates would be conducted, while also serving as a mechanism for providing standardized cost-estimating procedures to agency officials and contractors. DOE subsequently disbanded OCA and, instead of issuing a specific cost-estimating policy, chose instead to revise its project management order and supplemental guidance that sets requirements and provides suggestions on how to manage capital asset acquisition projects. While the revisions to the order and guide included some provisions to improve project cost-estimating practices, the project management order and supplemental guide only apply to activities involving capital asset acquisition projects and do not apply to the broader range of departmental activities involving cost estimating.[24] As part of our ongoing work, we will examine whether establishing a departmental cost-estimating policy that would apply to all departmental activities—including operating programs and noncapital asset projects, rather than just capital asset projects—could contribute to improvements in departmental cost estimating.[25] For example, information on the costs of program activities can be used as a basis to estimate future costs in preparing and reviewing budgets.
- The department's revised project management order appears not to meet cost-estimating best practices. Our preliminary observations indicate that as we found in 2010, DOE's project management order continues not to meet cost-estimating best practices.[26] We noted in our 2010 report that this order did not specify: (1) how cost estimates should be developed, (2) which phases of a project should be included in the estimate, (3) how the estimate should be maintained throughout the life of a project, and (4) when an independent cost estimate should be prepared. DOE revised its order in November 2010 to, among other things, include a requirement that an independent cost estimate be prepared prior to the approval of Milestone 2 for

[22] To evaluate whether NNSA is meeting generally accepted practices, we relied on our cost-estimating guide, GAO–09–3SP.

[23] GAO–10–199.

[24] According to DOE's capital asset acquisition order, capital asset acquisition projects typically include planning and execution of construction, assembly, renovation, modification, environmental renovation, decontamination and decommissioning, large capital equipment, and technology development activities.

[25] Noncapital asset projects may be managed as operating projects. Examples of such projects include stabilization, packaging, storage, transportation, and disposition of waste and nuclear materials and facility shutdown and deactivation activities.

[26] GAO–10–199.

projects with total project costs equal to or greater than $100 million. This revision partially addresses the issue involving independent cost estimates but does not fully align with best practices that propose independent cost estimates should also be prepared for Milestones 1 and 3.[27] Beyond this revision, DOE's revised order does not address any of the other shortcomings we reported on in 2010 as noted above. Our ongoing work will include a more detailed assessment of how this order could better align with cost-estimating best practices.

- NNSA and DOE cost-estimating guidance may not fully align with cost-estimating best practices. NNSA and DOE issued cost-estimating guides in 2010 and 2011, respectively, as part of efforts to improve cost-estimating practices. Our preliminary observations on these guides show that each generally aligns with cost-estimating best practices but also falls short in a few areas. For example, our preliminary observations on NNSA's 2010 guide shows that it meets or substantially meets 8 of the 12 criteria in our 2009 cost-estimating guide[28] and that it partially or minimally meets, four other criteria—these other criteria are in the areas of determining the structure of the estimate, conducting risk and uncertainty analysis, conducting sensitivity analyses, and presenting the estimate to management for approval. Our ongoing review will include a more detailed assessment of the 2010 NNSA and 2011 DOE guides and the extent to which they align with cost-estimating best practices.
- Other NNSA actions to improve cost-estimating practices may not align with cost-estimating best practices. NNSA has taken actions in recent years to improve its cost-estimating capabilities, but these actions may not fully reflect cost-estimating best practices. These actions have included: (1) issuing a policy in 2009 that defines requirements for conducting independent cost estimates; and (2) issuing separate guidance in 2012 to require that preliminary design for high-hazard nuclear facilities be at least 90 percent complete prior to the establishment of a project performance baseline.[29] With respect to NNSA's policy for conducting independent cost estimates, we found that the policy provides NNSA the discretion to conduct independent cost estimates for projects with estimated total costs below $100 million at Milestone 2. NNSA officials explained that a proposed revision to this policy would make these reviews mandatory for Milestone 2. While the revised policy may align with best practices for conducting independent cost estimates at Milestone 2, it may not reflect best practices that also propose conducting these reviews at Milestones 1 and 3. NNSA's guidance for completing 90 percent of the design for high-hazard nuclear facilities before establishing a performance baseline states its objective is to ensure that a highly credible cost estimate is developed prior to establishing a performance baseline. Our preliminary observations show that other projects may benefit from the completion of 90 percent of their preliminary designs, regardless of the extent to which the project is considered high-hazard. In addition, we have observed that NNSA's guidance to implement this requirement is articulated in an NNSA memo that has not yet been translated into official NNSA policy. According to NNSA officials, the 90 percent design requirement will be incorporated into the revision to the independent cost estimating policy. Our ongoing work will further examine these policies and the extent to which they align with cost estimating best practices.

OBSERVATIONS ON COST ESTIMATING AND INFORMATION FOR NNSA PROGRAMS

In June 2010, we reported on NNSA's program to operate and maintain weapons facilities and infrastructure and found that the agency's budget justification for this program significantly understated its costs.[30] Building on these findings, in July 2012, we reported on NNSA's implementation of its PPBE process, particularly in

[27] Section 310 of the Consolidated Appropriations Act, 2012 requires a separate independent cost estimate to be developed prior to milestones 2 and 3 for projects under DOE's project management order where the total project cost exceeds $100 million. (Pub. L. No. 112–74, 125 Stat 878 (2011)).

[28] GAO–09–3SP.

[29] DOE regulations define three categories of high-hazard nuclear facilities according to their potential to produce significant radiological consequences from an event that could either: (1) extend beyond the boundaries of a DOE site, (2) remain within the boundaries of a site, or (3) remain within the immediate vicinity.

[30] GAO–10–582.

the area of validating programs' budget requests, and we found deficiencies that we concluded effect the credibility and reliability of those estimates.[31] Preliminary observations from our ongoing work on cost estimating for this subcommittee show that DOE and NNSA may not have any specific cost-estimating requirements or guidance for programs.

In our June 2010 report, which focused on NNSA's fiscal year 2009 budget and expenditures, we reported on the extent to which NNSA's budget justification accurately reflected a program's cost. Specifically, we examined NNSA's program that operates and maintains weapons facilities and infrastructure and found that NNSA's budget justification significantly understated that program's cost.[32] We found that, because of allowable differences in contractors' cost accounting practices, NNSA could not accurately identify the total costs to operate and maintain weapons facilities and infrastructure. This condition is inconsistent with the Federal Accounting Standards Advisory Board standard on Managerial Cost Accounting, which states a general standard for Federal agencies to provide reliable and timely information on the full cost of Federal programs to allow an organization to assess the reasonableness of program costs and to establish a baseline for comparison. When we asked NNSA's site contractors to provide us with information on their fiscal year 2009 costs for each of the activities described by this program's work breakdown structure, six of eight sites fully responded. The costs for these sites' activities totaled over $500 million more—approximately $1.1 billion—than the $558.6 million NNSA included in its budget request to fund the program at these sites. We determined that one reason NNSA's budget estimate for this program was so different from the costs to execute its work scope was because NNSA's site contractors were not consistent in how they identified the activities they paid for with program funds. We concluded that, without the ability to consistently identify program costs, NNSA did not have the ability to adequately justify future presidential budget requests and risked being unable to identify both the return on investment of planned budget increases and opportunities for cost savings. Further, we recommended that M&O contractors report to NNSA annually on the total costs to operate and maintain weapons facilities and infrastructure to allow Congress to better oversee management of the nuclear security enterprise. NNSA agreed with our report and its recommendations.

Building on these findings, in July 2012, we reported on NNSA's overall budget formulation process, including its implementation of PPBE. We found that, according to senior NNSA officials, NNSA does not comply with DOE's order on budget formulation because the agency believes the order expired in 2003 and, therefore, no longer applies to NNSA budget activities.[33] DOE's order on budget formulation outlines the requirements for the department's annual budget formulation process including that budget requests "shall fully justify and describe intended program outputs and outcomes" and that budget requests "shall be based on cost estimates that have been thoroughly reviewed and deemed reasonable" by the cognizant program organization. Rather, we found that NNSA is guided by its own policy for the PPBE process, which includes how costs are estimated and validated for operating programs. Our 2012 review found significant deficiencies in NNSA's implementation of its PPBE process, leading us to conclude that the credibility of NNSA's budget proposals for operating programs is reduced, which effectively reduces the ability of Congress to decide on resource trade-offs. For example, we found the following:

- NNSA did not have a thorough, documented process for assessing the validity of its budget estimates prior to their inclusion in the President's budget submission to Congress. Instead, we found that officials conducted informal, undocumented reviews of budget estimates that contractors submitted, and that the level of review varied across site and headquarters program offices. According to NNSA officials, the agency's trust in its contractors minimized the need for formal review of budget estimates provided.
- NNSA's annual budget validation review process occurred too late in the budget cycle to inform agency or congressional budget development or appropriations decisions. We found that, while NNSA policy states that the timing of NNSA's budget validation review process should inform budgeting development and decisions, budget validation reviews were actually completed after the completion of budget formulation process.
- NNSA's budget validation review process was not sufficiently thorough to ensure the credibility and reliability of NNSA's budget because it was limited to assessing the processes contractors and programs used to develop

[31] GAO–12–806.
[32] GAO–10–582.
[33] GAO–12–806.

budget estimates rather than assessing the accuracy of the resulting budget estimates. In addition, NNSA guidance stipulates that to help ensure the validity of budget estimates NNSA conduct its validation process for 20 percent of the agency's programs request annually. However, we found that in fiscal year 2012 NNSA completed validation reviews for only 1.5 percent of its budget request.

In our July 2012 report, we recommended that, to enhance NNSA's ability to better ensure the validity of its budget submissions, and to decide on resource trade-offs, DOE should evaluate its budget formulation order and update it as necessary. Further, we recommended, among other things, that NNSA: (1) amend its budget validation review process, to ensure that all budget estimates are thoroughly reviewed by site and headquarters program offices, and that these reviews are timed to inform NNSA, DOE, OMB, and congressional budget decisions; and (2) reinstitute an independent cost analysis capability, as it had with OCA, to provide senior decisionmakers with independent reviews, including an analysis of different options for deciding on resource trade-offs, and facilitate NNSA making the best decisions about what activities to fund and whether they are affordable. NNSA, responding on behalf of DOE, stated that it generally agreed with six of the seven recommendations we made in this report, but NNSA disagreed with our report's characterization that the agency's budget estimate review process is not thorough.

In both our June 2010 and July 2012 reports, we discuss a data system NNSA was developing to provide a consistent framework for managing the PPBE process within NNSA's Office of Defense Programs.[34] In 2010, we found that to support development of this tool, NNSA was revising its work breakdown structure for its program to operate and maintain weapons facilities and infrastructure to ensure: (1) that activities associated with the program were identified; and (2) that the costs of these activities could be identified.[35] In 2012, we concluded that this type of tool could help NNSA obtain the basic data it needs to make informed management decisions, determine return on investment, and identify opportunities for cost saving.[36] For example, the tool included a mechanism to identify when decisions on resource trade-offs must be made if contractor-developed budget estimates for program requirements exceed the budget targets NNSA provided for those programs. Further, NNSA officials stated that they eventually plan to use this tool to compare budget estimates of program activities with the amounts the programs ultimately expended.[37] We learned in March of this year, as part of our work to follow up on recommendations made in our June 2010 report, that the tool is still in development and that NNSA has a pilot project under way to enhance the tool to provide full PPBE reporting for the B61 life extension program.

While development of this tool is positive, our ongoing work for this subcommittee on cost estimating has identified that at least one NNSA M&O contractor has acknowledged that weaknesses in NNSA's planning and budgeting have led to diminished credibility with the Department of Defense (DOD) and Congress that need to be addressed in the near-term. As such, DOD, in collaboration with NNSA, established an effort in January 2012 to balance the resources and requirements for the U.S. nuclear security enterprise with its budget needs for fiscal years 2014 to 2018, particularly where DOD has allocated funds to NNSA to augment the agency's budget in support of DOD requirements.[38] This effort to examine NNSA's resources and requirements is being conducted by DOD's Office of Cost Assessment and Program Evaluation (CAPE), which is tasked, among other things, with ensuring that the costs of DOD programs are presented accurately and completely. Among the CAPE's early findings has been to question NNSA's cost estimate for its life extension program for the B61 bomb. According to NNSA officials, the CAPE's $10.1 billion July 2012 independent cost assessment for this program was $2.2 billion higher

[34] The Office of Defense Programs accounted for 54 percent of the President's fiscal year 2013 budget request for NNSA.

[35] GAO–10–582.

[36] GAO, National Nuclear Security Administration: Observations on NNSA's Management and Oversight of the Nuclear Security Enterprise, GAO–12–473T (Washington, DC: Feb. 16, 2012).

[37] GAO–12–806.

[38] In 2010, the Secretaries of Defense and Energy signed a memorandum of agreement outlining budget commitments between the two agencies to modernize the nuclear weapons infrastructure of the United States and strengthen aspects of stockpile management. The agreement established that DOD would work to transfer to DOE $5.7 billion of budget authority in fiscal years 2011 through 2015 to support specific NNSA programs—such as the life extension program for the W76 warhead—and projects, such as the Uranium Processing Facility discussed above. The recently released President's budget for fiscal year 2014 provides annual estimates from fiscal year 2015 through 2023 for the amount by which DOD's budget authority will decrease and NNSA's will increase, totaling $14.8 billion.

than the cost estimate NNSA included in its Weapon Design and Cost Report. The CAPE identified several differences in assumptions that account for the difference between the two estimates. Additionally, the CAPE cited process issues related to NNSA's cost estimate, including a lack of historical data on the costs of previous life extension programs and a lack of a detailed program definition. These are the same types of issues we identified in our June 2010 and July 2012 reports.

Preliminary observations from our ongoing work for this subcommittee on DOE cost estimating show that DOE and NNSA may lack specific cost-estimating requirements or guidance for programs. We have conducted initial meetings with the managers of several large NNSA programs to determine what requirements and guidance are used to generate cost estimates for the work in their programs. These programs include the Plutonium Disposition Program in NNSA's Office of Defense Nuclear Nonproliferation as well as the B61 Life Extension Program and the Science Campaigns in NNSA's Office of Defense Programs. NNSA officials responsible for the Plutonium Disposition Program told us they have constructed a life cycle cost estimate for the overall program, but that there is no (1) DOE or NNSA requirement that would prescribe how such an estimate should be developed or (2) requirement for an independent review of this estimate. An independent review of such an estimate is important given the magnitude of some of DOE's and NNSA's larger programs—for example, the current life cycle cost estimate for the Plutonium Disposition Program is more than $23 billion. Similarly, NNSA officials responsible for the B61 Life Extension Program told us that in constructing a cost estimate for the program they consulted guidance, including DOE's project management order, but DOE and NNSA do not specify detailed cost estimating methodologies. Unlike the Plutonium Disposition Program, however, the estimate for this program has undergone several reviews, including by the CAPE. NNSA officials in the Science Campaigns told us that their activities are ongoing in nature rather than a more traditional project or program that has a definitive start and end date and, as a result, its cost estimates are prepared by way of the annual budget formulation process and prepared consistently with departmental budget formulation guidance and supplemental NNSA guidance. Our ongoing work will continue to assess these issues to determine how cost estimates are generated for NNSA programs and the extent to which any requirements and guidance for these activities align with cost estimating best practices.

We plan to report on this ongoing work later this year.

Chairman Udall, Ranking Member Sessions, and members of the subcommittee, this completes my prepared statement. I would be pleased to respond to any questions you may have at this time.

GAO CONTACT AND STAFF ACKNOWLEDGMENTS

If you or your staff members have any questions about this testimony, please contact me at (202) 512–3841 or trimbled@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. GAO staff who made key contributions to this testimony are Allison B. Bawden and Daniel J. Feehan, Assistant Directors, and Michael Meleady, Timothy Persons, Cheryl Peterson, Karen Richey, Peter Ruedel, Rebecca Shea, Joseph Thompson, and Jack Warner.

Senator UDALL. Thank you, Mr. Trimble.

Let me recognize Senator Donnelly. I think we will do 5-minute rounds. I am going to step out for a minute. If I am not back after 5 minutes, I know Senator Donnelly will then recognize Senator King who has joined us from the great State of Maine.

Senator Donnelly?

Senator DONNELLY. Thank you, Mr. Chairman.

Thank you to all of you for your hard work.

Admiral Richardson, as we look at the reactors that will be used and as we move forward, this is an area that strikes me as, as we move forward, you could almost have quantum leaps in technology. So when our core will be good for 42 years, how do we continue to improve that during that time?

Admiral RICHARDSON. Senator, first, that is a big leap to develop a 42-year core.

Senator DONNELLY. Well, no. Do not worry. I know what an amazing accomplishment that is. What I am saying is that technology, to be able to do that, a 42-year core, is a tremendous accomplishment.

Admiral RICHARDSON. Yes, sir.

Senator DONNELLY. Now, during that life of that core, do we continue to do the research to make it stronger, better, quicker, faster, less waste?

Admiral RICHARDSON. Yes, sir, we do. That is the work that is constantly being done by the folks at my headquarters and in those labs. They are constantly at work looking for those next opportunities to reduce cost, reduce waste, do all of those things that will allow us to execute the Navy's mission at a lower cost and a more responsible pace. So that is that base funding that is an effort that is ongoing in conjunction with our vendor base.

Senator DONNELLY. On the vendor base, obviously, being from Indiana, we take great pride in our participation in this.

But what is the outlook for continued reduction of the waste to a point where—will there be a point where there is no waste? Will there be—I will just leave it at that.

Admiral RICHARDSON. I think that as long as you are—what our aim is, is to reduce that waste. As long as you are burning fuel and burning cores, there will be some waste at the end.

There are two ways that we are constantly taking a look at reducing that waste stream. One is by virtue of building a core that lasts 42 years, that is just that much less material that you have to do. Our first cores, for instance, lasted 2 years, and at the end of that 2-year period, you would have to refuel. That is a lot of spent fuel that we had to do that. So over the decades, we have reduced that by a factor of 20 by virtue of building a 42-year core.

The other thing is we are constantly on the lookout for those technologies that allow us, when the conditions permit, to perhaps approach a recycling type of a technology where the fuel can be recycled.

So it is the combination of those two efforts primarily right now through the longer cores, the reduction of the material that allow us to minimize the waste that we produce.

Senator DONNELLY. How will that new core work in regards to performance inside? Obviously, on the nuclear part, but performance inside of the boat itself. How does it make the sub itself so much more effective in terms of speed, technology, and other areas?

Admiral RICHARDSON. The core itself will allow the submarine to execute its mission for that 42-year life, but then there is the reactor plant around that core and the propulsion plant that that core is connected to. Those are the sorts of things that get after the mission effectiveness of the submarine itself in terms of stealth primarily, and then those core attributes of speed and other things that allow the submarine to be an effective deterrent as far out as we can see the threat.

Senator DONNELLY. I just want to finish up by saying we not only saw off the shores in North Korea, but in so many other places, that the presence of not only carriers and other ships, but the presence of the unknown to other people the submarines has acted as an incredible deterrent. We want to thank everybody in-

volved in the program for what you have done. So thank you very much.

I will pass it on to Senator King.

Senator KING. Thank you.

Gentlemen, thank you for your testimony.

DOD's 3+2 strategy, where we are going to have interoperable warheads, it seems to me requires a great deal of coordination between DOD and NNSA and, should there be waste involved, EM. Could you update me on the progress of that strategy and whether you believe we can implement it in a safe and cost-effective way? Are the departments working together? Are they talking to each other? Where do we stand on that development?

Dr. COOK. I will update you, Senator.

We work together and we talk together every week, sometimes every day between NNSA and DOD.

With regard to the strategy, we now have a comprehensive plan that covers the entirety of the stockpile. That is why you will continue to hear 3+2, meaning three interoperable systems for the ballistic leg, two legs, and two systems interoperable for the air-delivered leg.

The actual status of implementation was called for in the nuclear posture review of 2010. We now have an implementation strategy, and we are turning that into resource plans.

The first part of that is to continue and complete the W76 LEP. We have achieved the full build. The rate is steady. We are through the early birthing defects and we will complete that program by 2019.

To think of the second wave, the second wave consists of the B61 LEP. That will improve the air-delivered leg and the W88 Alt. So this updates the AF&F system for the W88. That will also be the basis for the first interoperable warhead, AF&F. Those will be entering the first production unit in 2019. They are already in full-scale engineering design, and the build of those will be completed around the end of 2024 or 2025.

Then the third wave will come on, and that is the first interoperable system, the W78 and 88 LEP. There will be beyond that a second and third interoperable, but that is the strategy that is being conducted. The most important thing to the strategy is, first, having an overall plan—we have that—second, having a good partnership between DOE and DOD. We have that. Clarity of execution and then a real keen eye given to the cost and the schedule maintenance is what we are working on most strongly now.

Senator KING. So it is too early to really talk about cost. You are still in the planning and design stage.

Dr. COOK. I would differ. It is not too early to talk about cost. We are managing the W76 program according to the cost requirements. B61–12, we have a weapon design and cost report. We will be submitting a very initial baseline soon. We know that there is considerable risk associated with that, but in this future years NSP, in the President's request for 2014 through 2018, we will have 5 of the 6 years of the B61 program up to the first production unit. So we have a very strong attention given to cost. We are developing integrated master schedules for each of the LEPs, a completed risk register, and we will be moving to a point of having re-

source-loaded schedules in industry standard tools as well as these proceed.

Senator KING. Do existing warheads have a life expectancy? Do they degrade in some way over time?

Dr. COOK. They do degrade and they do have a life expectancy, although we have been able to stretch that. These weapons were put into service in the 1970s and 1980s nominally with a 20-year life and a 25-year life of program buy, which means we had enough components to extend another 5 years. They are now well beyond that time. The B61 is the oldest system in the stockpile, and we have the greatest needs to do its life extension. But the elements of that system have been around 40 years and key parts of it still have in the radar system vacuum tubes.

Senator KING. You can send most of them to the Smithsonian. [Laughter.]

Dr. COOK. In fact, we probably will. [Laughter.]

In terms of cost forward, Sandia is developing a radar system that will be pertinent not only to the B61 but also to the W88 and the W87 life extensions as well. So a strong attention to cost, but a real need to improve the systems.

Senator KING. Other comments from any of you?

Mr. HUIZENGA. I will just point out, Senator, relative to our relationship with NNSA, we obviously work closely with our partners there with the TRU waste that we are removing from the mesa at the Los Alamos National Laboratory which is indeed important to the overall benefit for the laboratory. We do not want to have another wildfire approach that waste, so we are trying to move that as quickly as possible in support of our colleagues.

Senator KING. Do we do any recycling of nuclear waste, or is it all stored somehow? Do we have any reprocessing?

Mr. HUIZENGA. In general, we are disposing of the waste. There are broader issues associated with nuclear fuel and power plant fuel that can be wrestled with.

Senator KING. But in the defense area, we basically are disposing of the waste. There is no reprocessing process.

Mr. HUIZENGA. Currently, yes.

Senator KING. Along that line, as I understand it, as we have been decommissioning these reactors and cores, we have created something like 75 million gallons of liquid nuclear waste. Are you confident that the facilities that we have, Idaho, South Carolina, and Washington, are adequate into the indefinite future? Is there going to be need for a new siting? Would you prefer a different storage for this liquid waste? I understand it is basically in large tanks. Is there another solution that might be a preferable balance between safety and cost?

Mr. HUIZENGA. I think the path we are on right now for this liquid high-level waste is the appropriate one. We are making glass logs and solidifying waste at the SRS plant and doing well at our defense waste processing facility. We have already solidified all of the liquid waste at the West Valley site. Indeed, we have this 900,000 gallons left at Idaho, and we are in the process of starting up that facility to stabilize that material. So the large amount of material, the complicated waste stream that we have with the Waste Treatment Facility at Hanford is, indeed, our biggest chal-

lenge. But we think we have our sights set on being able to address that and solidify that material as well.

Senator KING. Is Hanford principally managed by your agency?

Mr. HUIZENGA. Yes, it is.

Senator KING. That is your challenge?

Mr. HUIZENGA. That is my challenge.

Senator KING. I understand.

Admiral Richardson, Portsmouth Naval Shipyard does maintenance on attack submarines, and as I understand it, we had a hearing this morning about shipbuilding plans and projections for the force. Under the 306-ship plan, the Navy's projection is to go to 42 attack submarines in 2029, down from 55 today, and that is a pretty significant decrease. What do you see the role of the maintenance yards? Given that decrease, how do we maintain the industrial base? What will the impact of that be on the facilities like Portsmouth and others?

Admiral RICHARDSON. Yes, sir. We, obviously, take a close look at that, and as far out as we have plans right now for Portsmouth, that shipyard is busy with those refuelings and decommissionings. Beyond that, working closely with my colleague, Vice Admiral McCoy, there is really an enterprise-wide approach using all the shipyards in the country to best level the load for nuclear ship maintenance. As we look forward to planning beyond the current horizon, we will continue that enterprise approach to make sure that we are best postured to support that fleet.

Then, sir, that is the low point perhaps in the shipbuilding plan, but we will be building back up from that point as well. So not only the 48 or so attack submarines, but then the follow-on to the *Ohio*-class as well.

Senator KING. Thank you.

Senator UDALL. Thank you, Senator King. It is an important part of Maine's economy and the great role that Maine plays in our country.

Dr. Cook, let me turn back to the posture review from 2010. It requires you to put in place a large number of programs. I do not have to tell you that. You are required to overhaul the B61. You finish up the W76 warhead for the Navy by 2019. You are going to conduct the joint fuze program on the W88 warhead with common components for the intercontinental ballistic missile (ICBM) W87 warhead and eventually the ICBM W78 warhead.

Are you concerned about the overlap or the subelements in the B61 program between Sandia, the Kansas City plant, and even Y–12 where the components are produced?

Dr. COOK. It is a good question. Let me give several aspects to the answer.

First, what is generally called concurrency is a real concern. So dealing with concurrency is something we must do. We cannot avoid it because we have the oldest stockpile we have ever had. The average age of the warheads is now 26 years and counting, and frankly, they range from about 20 years to getting close to 40 years now. So in dealing with that concurrency, the most important thing is to have a strategic plan, vector one toward a stable base workload that uses the entirety of the complex in the wisest way because that will be the most cost-effective way, and then schedule

the activities so there is not multiple overlap that is too high a stressor in what would otherwise be a bottleneck. So a strategic plan is very important.

Then another way to reduce the impacts of concurrency is through leveraging the nonrecurrent engineering and getting multiple use out of it. In other words, I mentioned—and I understand with the lab directors, Director Paul Hommert showed the radar module for the B61. That is, in fact, the same one for the W88 Alt and for the MK21 fuze. So one set of engineering applied three times really leverages. Now, if there were not some concurrent work, that leveraging would not be possible. So some aspect of concurrency is really important.

But there is a down side. If there is too much and if schedule slips, if they get stretched out, if the funding is not made available for the LEPs, then not only do schedules slip, they begin to overlap and the consequence is we have costs and then we have real bottlenecks.

Senator UDALL. Let me ask you about Sandia. Are you concerned about too many programs carried out at Sandia all requiring component manufacturing at the Kansas City plant while it is moving into the new facility?

Dr. COOK. Again, it is a good question. I would say I have a concern, but I am not overly concerned because we have mitigation steps in place. What we are going to do is track them very carefully. Specifically, the Kansas City plant move—the new plant at Box Road is completely done now. The move is happening in fiscal year 2014 and by the end of 2014, all of that move will occur.

When we looked at all of the risks and considered them, we felt they were all manageable except one and that was the assembly of the AF&F system. That is where it all comes together, and that had been a sticking point with getting to the W76 build rate. So, in fact, we created some duplicate capabilities, one in the existing plant, one in the new plant so that that risk would be addressed. Both are going to be used while we make the transition.

Senator UDALL. Let me go to bombers. With the B61 life extension, we need both the weapons and the bombers.

Dr. COOK. Sure.

Senator UDALL. NNSA projects the B61 life extension to cost, I think, something like $8 billion, and the DOD CAPE projection is $10 billion. Can you talk about that difference? How did it come about?

Dr. COOK. First, knowing what the difference is is quite important. NNSA and CAPE have been working, I think as Administrator Miller said and I agree, very closely together. It is a different set of assumptions that leads to the different costs. The scope is the same. The elements are the same.

In our plan and what we provided to Congress now, weapon design and cost report, that is a cost at the end of conceptual design. There is considerable risk in the program, and something CAPE, I would say, increased our awareness to is the overlapping elements of different phases or turns of the prototype hardware. Things move along pretty quickly. So from the time we began to work with CAPE, a full year has gone by. Sandia is already into the first turn of flight hardware, and that was why you could see

things that are relatively finished products yesterday. We will continue to monitor that.

The CAPE assumption on the down side, I would say, is if we do not succeed in achieving the first production unit in 2019, which requires budget stability, it requires careful management, it requires risk management—if we do not achieve that and the program begins to slip for whatever reason, failure to manage the risk or failure to get the budget authorized and appropriated, then things will begin to pile up and we will lose year by year. CAPE's assumption was if we lost 3 years, we extend the program 3 years, and it costs $2 billion more. I actually agree with that. If that consequence occurs, that will be the cost.

Senator UDALL. I appreciate that clarification. We are going to need to, I think, harmonize those two different numbers although, as you point out, there are different assumptions behind them. The important thing is we move to the markup.

Let me turn to Admiral Richardson. Admiral, I know you have received a 15 percent increase in your 2014 budget. Can you describe what the increase was for and why it was so large?

Admiral RICHARDSON. Yes, sir. The increase really is a result of a couple of different dynamics. First, the primary increase is to support those three major projects that I described in my statement: the replacement for the *Ohio*-class submarine, that reactor plant; the refueling of the land-based prototype; and also the recapitalization of our spent fuel facility in Idaho.

As the Budget Control Act took place, the ramps that were associated with those new projects got leveled off at constant year funding levels. As we have been involved in the effort with OSD CAPE and the rest of NNSA, those projects were assessed as part of that effort over the past year, the costs associated with those, the validation of the mission, so that that increase really is a restoration of those projects.

There is a slight increase above that associated with—amounting to roughly a 2-year slip in the spent fuel handling project and also the *Ohio* submarine reactor plant. So there is some escalation associated with that and some efficiency that we lost by virtue of those slips.

But those three projects with that slight increase due to the slip account for our increase, all linked very directly to supporting the fleet on a timeline that makes sense for them.

Senator UDALL. I know we are approaching 4 p.m. I want to see if Senator King had any additional questions, and then I will conclude with one or two questions. Senator King?

Senator KING. It would not be a hearing in the U.S. Senate in the spring of 2013 if somebody did not ask about sequestion. How is it affecting your operations, if at all? If not, that is important to know. If it is, I would like to know that too and what the severity is and what the impact would be if it continues beyond 2013. Admiral?

Admiral RICHARDSON. Thank you, Senator.

With respect to the impact of sequestration, it is really being felt across the Navy and Naval Reactors is not immune from that. The combined CR and sequestration cuts for our program are approximately $95 million in fiscal year 2013. That really affects most di-

rectly our ability to progress the refueling of that land-based prototype which, as many of these effects have, is a snowball effect forward to retiring risk for the life of ship core for the propulsion plant for the next submarine. So that inability to place about $30 million worth of contracts to help us get at understanding the material science associated with that life-of-the-ship core, the sequestration—these funding levels will also necessitate that we again delay the spent fuel handling project. That will, again, result in increased costs for that project when it eventually does get built. In the interim, because the carrier fleet is coming in for refueling and that fuel is coming off those reactors, we will have to spend money, about $100 million a year, to build temporary storage facilities for those cores just to hold them until that handling facility gets built.

The other part, which is particularly of concern, goes to your original question, sir, about the industrial base, both in the private sector, our vendors, and also the shipyards. As the sequester and the CR manifests itself through the combined effects of hiring freezes, layoffs of temporary workers, potential furloughs, we are seeing reductions in the shipyards of over 30 percent in terms of the capacity. That again is a snowballing effect which will directly translate to delays in the shipyard, which will translate again to reduced time at sea for those critical naval assets and less operational availability as they work to try and get out and do the Nation's business. We will see some of that effect in 2013. That effect will build in 2014 and will build again in 2015 unless we can turn this around.

Similarly, in the private sector, particularly as you move through our tier-one vendors and into the second- and third-tier vendors, small businesses that do a big portion and maybe all of their business with us to supply components for these plants—those businesses are at particular risk as well.

Senator KING. I would assume—I do not want to put words in your mouth, but I would assume that one of the issues is the uncertainty surrounding the budget situation. It almost does not matter what the solution is. We just need a solution. Would you concur?

Admiral RICHARDSON. Sir, I think Administrator Miller spoke very eloquently about that, that the combined uncertainty sends a shock wave through the system. It is that certainty and confidence too that also—particularly in our business where we do a lot of work with unique vendors, very advanced technology, that certainty and confidence that the business will be there at predictable funding levels allows it to do the sorts of investments to reduce that cost and get after this capability at the minimum cost. Not only is there a people manifestation of that uncertainty as people look for where they want to spend their lives working, but also it almost guarantees that this equipment will come in at higher cost because we have to do it year-by-year rather than doing it over a period of time that allows us to take advantage of fluctuations in the market.

Senator KING. Thank you.

The sequester is going to end up costing us money, Mr. Chairman.

Senator UDALL. The Senator from Maine is exactly right. We are operating under the illusion it is going to save money. But Administrator Miller shared with us earlier that the CRs have the same effect. We can feel good that we are cutting Government spending, but, in fact, we are not. We are adding additional costs.

Thank you for that observation. Thank you for being here today.

Mr. Huizenga, I am not going to direct a question to you, although we are going to keep the record open, but I did want to acknowledge the work you do. I think you are well aware of a little plant we had in Colorado, Rocky Flats. I worked for many a year as a Member of the House to see that project completed. Senator King, this is a wonderful story of what we can do if we focus in the EM area. We have cleaned up that facility for the most part. There is a core area that will have to be monitored for hundreds of years, but the surrounding 4,500 acres are now a wildlife refuge and there are herds of elk, songbirds, and red-tailed hawks. The Fish and Wildlife Service now is managing it. It is an example of what we can do. We saved a lot of money but we have to invest on the front end in cutting-edge technology.

Mr. HUIZENGA. We learned a lot of lessons at Rocky Flats, and we are trying to use those across the complex.

Senator UDALL. We certainly did. Just because we have gotten ours in Colorado does not mean I am moving on to other missions. I have made a commitment to Hanford and to Savannah and Pantex and Fernold and Oak Ridge and all the other sites. So as the chairman of this subcommittee, I am going to work with you to see that we keep faith with the people in those communities and do the work we said we were going to do.

Mr. Trimble, the last question I want to direct your way is the following, and it ties to a common indirect cost structure. Can you give some recommendations for implementing a common indirect cost structure at the labs so that we can compare how efficient they are in executing their programs?

Mr. TRIMBLE. This can be a very technical area. So I will try to make it pretty simple, which is the level I operate at most times.

I think to go forward in this area, the first thing I would recommend is, one, I think engaging the CAPE given their vast experience would be very useful.

I think in terms of the elements that would be needed, first you would need a standard work breakdown structure across NNSA that deals with both direct and indirect. I do not think you can parse it out to just the indirect. You have to tackle both at once, otherwise you can play a shell game where stuff can be moved around. So you have to tackle it for both direct and indirect. It has to be consistent across the complex, and then it has to be consistently applied.

To put meat on this, for example, if you have a line item for a program, say, for infrastructure and you say, okay, I am going to give $100 for infrastructure, the lab can take money from that account for infrastructure and that is what you think they are doing. But if they can also take it from another program to pay for infrastructure and they can take it from transportation to pay for infrastructure, if you can take it from multiple funds, all of a sudden you have lost the ability to have an insight into what your program

costs. So the idea of a common work breakdown structure and a disciplined one is to have transparency and consistency in how those costs are allocated so that you are then in a position to manage your program from both a program effectiveness standpoint, as well as from a budget standpoint. So it is very important and it is very dry, but it is absolutely critical to move the ball forward in this area.

Senator UDALL. I agree, and I see Senator King listening very carefully. He was Governor of Maine. He knew that every dollar of taxpayers' funds had to be spent well and with transparency.

I look forward to working with you on this. I am not on a mission to expose the NNSA or DOE or DOD. It is just we need and have the responsibility to continue to work to provide better Government services, more efficient government services, in this really crucial area.

Again, I want to thank Senator King for attending. I want to thank you all for your time.

We will keep the record open for 2 days, through the end of the business day on Friday. We are working overtime to prepare the authorization bill for the committee, which we will take up next month. So that is why the short timeframe to keep the record open. But I know you will all be available to answer any questions.

With that, the Subcommittee on Strategic Forces is adjourned.

[Whereupon, at 4:10 p.m., the subcommittee adjourned.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 2014 AND THE FUTURE YEARS DEFENSE PROGRAM

THURSDAY, MAY 9, 2013

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

BALLISTIC MISSILE DEFENSE POLICIES AND PROGRAMS

The subcommittee met, pursuant to notice, at 2:32 p.m. in room SR–222, Russell Senate Office Building, Senator Mark Udall (chairman of the subcommittee) presiding.

Committee members present: Senators Udall, Donnelly, King, Fischer, and Lee.

Committee staff member present: Peter K. Levine, staff director.

Majority staff member present: Richard W. Fieldhouse, professional staff member.

Minority staff member present: Robert M. Soofer, professional staff member.

Staff assistant present: Lauren M. Gillis.

Committee members' assistants present: Casey Howard, assistant to Senator Udall; Marta McLellan Ross, assistant to Senator Donnelly; Lenwood Landrum, assistant to Senator Sessions; Peter Schirtzinger, assistant to Senator Fischer; and Peter Blair, assistant to Senator Lee.

OPENING STATEMENT OF SENATOR MARK UDALL, CHAIRMAN

Senator UDALL. The Subcommittee on Strategic Forces will come to order. Good afternoon. I will open with a short statement. Senator Fischer is here; we'll turn to her; and then we will look forward to hearing what our witnesses have to say.

We are here today to hear testimony on the ballistic missile defense programs and policies in the President's budget request for fiscal year 2014 and related matters. This has been a busy year for missile defense. On March 15, Defense Secretary Hagel announced a new series of missile defense plans for the Homeland. These included deployment of 14 additional ground-based interceptors (GBIs) in Alaska, deployment of an additional missile defense radar in Japan, and termination of the development program for the Block 2B version of the Standard Missile-3 (SM–3) interceptor.

The Department of Defense (DOD) has also taken a number of prudent and timely missile defense actions in response to the bellicose rhetoric and threats from North Korea, including the deployment of a Terminal High Altitude Area Defense (THAAD) system battery to Guam, the deployment of Aegis missile defense ships off the Korean Peninsula, and deployment of the sea-based X-band missile defense radar into the Pacific Ocean.

We will want to learn today about DOD's programs, policies, requirements, and capabilities to defend the Homeland against current and potential future missile threats from North Korea and Iran, and to defend our forward-deployed forces, our allies and friends against existing and growing regional missile threats from those nations.

Our missile defenses must be operationally effective, cost-effective, and affordable. This latter point is especially important at a time when Congress is imposing harmful funding reductions across government programs, including missile defenses. In this regard, our missile defense testing programs are critical to understanding and demonstrating the capabilities of our systems and giving us confidence that they will work as intended. Many tests are coming up this year and we are keen to learn of the plans and progress in correcting the problems we encountered in earlier flight tests with the kill vehicle for the GBI. We also want to understand if our missile defense acquisition programs and practices can provide improved capability with reduced technical, schedule, and cost risk.

To help us understand these complex issues, we have five expert witnesses with us today. The Honorable Madelyn Creedon is the Assistant Secretary of Defense for Global Strategic Affairs and is responsible for policy and strategy matters relating to ballistic missile defense, among many other issues. Consequently, she is a frequent witness before the committee, and we welcome her back to the subcommittee.

The Honorable Michael Gilmore is the Director of Operational Test and Evaluation at DOD. He plays a crucial role as an independent adviser to DOD and Congress on the adequacy and results of our operational testing and on the performance of our weapons systems, including missile defense systems.

Lieutenant General Richard Formica is the Commander of U.S. Army Space and Missile Defense Command and also the Commander of the Joint Functional Component Command for Integrated Missile Defense under U.S. Strategic Command (STRATCOM). We welcome you back before the subcommittee. I understand you're planning to retire this summer, so I want to offer our special thanks for your many years of dedicated service to the Nation and to the Army.

Vice Admiral Jim Syring is the Director of the Missile Defense Agency (MDA), which is responsible for designing, developing, integrating, and building most of our Nation's missile defense capability, certainly among the most complex weapons systems we have ever developed. This is his first appearance before the subcommittee as the Director.

Ms. Cristina Chaplain is the Director of Acquisition and Sourcing Management at the Government Accountability Office (GAO) and

leads their annual effort to review our missile defense acquisition programs, among others.

We welcome you all to the subcommittee and we welcome you, Ms. Chaplain, back to the subcommittee. In the interest of time, I would ask each of you to make very short opening comments, no more than 2 minutes, before we begin our questions. We'd be happy, of course, to include your prepared statements in the record.

Before turning to you, I did want to ask Senator Fischer, who's serving as our ranking member pro tem today, for any opening comments she may wish to make.

STATEMENT OF SENATOR DEB FISCHER

Senator FISCHER. Thank you, Mr. Chairman. It is a pleasure to be with you once again today. I will forego making any opening statement so that we have more time to hear from our expert witnesses and be able to ask them questions. But I would ask that my opening comments be included in the record.

[The prepared statement of Senator Fischer follows:]

PREPARED STATEMENT BY SENATOR DEB FISCHER

I would like to welcome the witnesses, and especially Admiral James Syring, who is appearing before this subcommittee for the first time since his appointment as Director of the Missile Defense Agency last November.

On March 15, Secretary Hagel announced the deployment of an additional 14 ground-based interceptors at Fort Greely, AK "to stay ahead of the long-range ballistic missile threat posed by North Korea and Iran." This is a prudent step and will provide the President additional flexibility to deal with threats to the United States and its vital interests. As U.S. Northern Command Commander, General Jacoby, told Congress, 'we must not allow regional actors, such as North Korea, to hold U.S. policy hostage by making our citizens vulnerable to a nuclear intercontinental ballistic missile attack.

In fact, Secretary Hagel's announcement is only the latest in a series of actions taken by nations across the globe to counter missile defense threats to their territory and populations: Israel deployed the Iron Dome to counter rockets launched from Gaza; Turkish leaders requested Patriot batteries to protect against Syrian missiles; and we, along with our Japanese and South Korean allies, recently activated ground- and sea-based missile defense systems in response to North Korea. These actions illustrate the important and stabilizing role played by missile defense.

I am, however, concerned by the termination of the SM–3 block IIB missile, which was announced alongside the decision to purchase the 14 additional ground-based interceptors. The SM–3 block IIB was intended to be deployed in Poland for the protection of the United States from Iranian attack. Our current defensive systems, as General Kehler, Commander of U.S. Strategic Command, testified to the committee earlier this year, 'are not in the most optimum posture to do that.' The Missile Defense Agency is evaluating three locations in the continental United States for a future missile defense site to address this need, and is also required by the National Defense Authorization Act for Fiscal Year 2013 to develop a contingency plan for such an additional deployment.

General Jacoby recently testified before the House Armed Services Committee that "a third site, wherever the decision is to build a third site, would give me better weapons access, increased ground-based interceptor inventory and allow us the battlespace to more optimize our defense against future threats from Iran and North Korea." I look forward to hearing Admiral Syring's views on the value of an additional homeland missile defense site, as well as his assessment of its technical feasibility and cost.

To conclude, I would note that while Secretary Hagel's announcement was positive, that good news was mitigated by the president's plan to spend $1.7 billion less on missile defense over the next 5 years. This reduction in funding, which comes on top of previous cut-backs, will make it increasingly difficult for Admiral Syring to carry out the President's new direction while also maintaining ongoing programs to develop and deploy missile defenses for our deployed forces and allies.

I look forward to hearing our witnesses. Thank you, Mr. Chairman.

Senator UDALL. Without objection, that will be done.

Let's go right to the—Madam Secretary, thank you for being here and the floor is yours.

STATEMENT OF HON. MADELYN R. CREEDON, ASSISTANT SECRETARY OF DEFENSE FOR GLOBAL STRATEGIC AFFAIRS, DEPARTMENT OF DEFENSE

Ms. CREEDON. Thank you very much. Senator Udall, Senator Fischer, it's a pleasure to be here today.

I would like to turn to and highlight some of the progress that we have made on some key policy priorities, particularly the recent decisions to strengthen Homeland defense. The U.S. Homeland is currently protected against potential limited intercontinental ballistic missile (ICBM) attacks from North Korea and Iran by the ground-based midcourse defense (GMD) system. As stated in the 2010 ballistic missile defense review, we are committed to maintaining an advantageous position vis-a-vis those and other threats.

To do so requires continued improvement to the GMD system, including performance enhancements to the GBIs and the deployment of new sensors, along with upgrades to the command and control networks. To stay ahead of the threat, as we have said we would do, in this case the growing threat from North Korea, President Obama recently decided to strengthen the U.S. Homeland missile defense posture. The decision was announced by Secretary of Defense Hagel on March 15 and DOD is now in the process of implementing that decision. This decision also recognized the delay to the SM–3 2B program, largely due to the fiscal year 2012 funding cuts and to the fiscal year 2013 continuing resolution.

As Secretary Hagel announced, DOD will add 14 interceptors to the GMD system, for a total of 44 deployed GBIs by 2017, and deploy a second TPY–2 radar to Japan. Deployment of the second radar to Japan will provide improved early warning and tracking of any missile launched from North Korea at the United States or Japan and will improve both homeland and regional defenses.

We had planned to deploy the SM–3 2B interceptor for the defense of the United States from land-based sites in Europe, but the deployment schedule had been delayed to at least 2022 due to cuts to the requested level of funding for the interceptor and the continuing resolution. As a result, we decided to shift resources from this program to the GBI program to cover the cost of the 14 additional GBIs, as well as to the technology development line to develop new advanced kill vehicle and booster technologies. These decisions will allow us to improve our defense against any ICBMs from Iran sooner than we otherwise would have, while also providing additional protection against the North Korean threat.

To be clear, there is no money in the fiscal year 2014 budget request for the SM–3 2B program and we are no longer planning for phase 4 of the European Phased Adaptive Approach (EPAA). As a result of much discussion, our allies understand and accept this SM–3 2B decision, and we have reinforced with them that our commitment to phases 1 through 3 of the EPAA remains ironclad.

We have also worked with other regional allies and partners in the Asia-Pacific and the Middle East to improve cooperation and enhance regional missile defenses. We have deployed a THAAD to

Guam as a precautionary move to strengthen our defense posture against the growing North Korean regional ballistic missile threat, and the deployment strengthens our defense capabilities for American forces and citizens in the U.S. Territory of Guam. This deployment is an example of the benefit derived from our investments in mobile missile defense systems, which can be deployed worldwide as required.

We also continue to work with our Gulf Cooperation Council partners on regional missile defense cooperation, and, of course, we continue to support Israel and its missile defense systems, including the Arrow codevelopment program.

The President's budget request for fiscal year 2014 reflects DOD's goal of retaining the flexibility to adjust and enhance our defenses as the threat and as technologies evolve. Our most vital security commitments, the defense of the United States, and our protection of our allies and partners and our forces around the world, demand nothing less.

Thank you and I look forward to your questions.

[The prepared statement of Ms. Creedon follows:]

PREPARED STATEMENT BY HON. MADELYN R. CREEDON

INTRODUCTION

Chairman Udall, Ranking Member Sessions, and members of the subcommittee, thank you for the opportunity to testify in support of the Department's fiscal year 2014 budget request for missile defense. Ballistic missile defense is a critical capability for the United States with important ramifications for several of the Department's mission areas.

The President's budget requests $9.2 billion in fiscal year 2014 and $45.7 billion over the Future Years Defense Plan to develop and deploy missile defense capabilities that protect the U.S. Homeland and strengthen regional missile defenses. The administration remains committed to developing proven and cost-effective missile defense capabilities through the phased adaptive approach to regional missile defense. This approach puts emphasis on a flexible military toolkit with forces that are mobile and scalable so that they underwrite deterrence in peacetime, but can be surged in crisis to meet defense requirements.

I will begin with a discussion of the ballistic missile threat, and then focus on our progress on three key policy priorities: sustaining a strong homeland defense, strengthening regional missile defense, and fostering increased international cooperation and participation.

BALLISTIC MISSILE THREAT

We continue to see well-established trends associated with ballistic missile development, including larger numbers, greater ranges, and more advanced systems. There is also evidence that such weapons are becoming a convention of contemporary warfare, as evidenced most recently by the use of ballistic missiles in the crisis in Syria.

Iran

The Intelligence Community (IC) assesses that Iran is developing nuclear capabilities to enhance its security, prestige, and regional influence and give it the ability to develop nuclear weapons, should a decision be made to do so. Although we do not know if Iran will eventually decide to build nuclear weapons, Iran has developed technical expertise in a number of areas—including uranium enrichment, nuclear reactors, and ballistic missiles—from which it could draw if it decided to build missile-deliverable nuclear weapons.

The IC assesses that Iran would likely choose a ballistic missile as its preferred method of delivering a nuclear weapon, if one is ever fielded. Iran has demonstrated an ability to launch small satellites, and has worked to develop larger space-launch vehicles and longer-range missiles.

Iran already has the largest inventory of ballistic missiles in the Middle East, and it is expanding the scale, reach, and sophistication of its arsenal. Iran's growing ballistic missile inventory and its domestic production of anti-ship cruise missiles (ASCM) and development of its first long-range, land-attack cruise missile provide capabilities to enhance its power projection.

Syria

While Syria does not pose a ballistic missile threat to the U.S. Homeland, the Asad regime does possess short-range ballistic missiles, and has shown a willingness to use them repeatedly against the Free Syrian Army. Additionally, the IC assesses that Syria has an active chemical warfare (CW) program and maintains a stockpile of sulfur mustard, sarin, and VX nerve agent; along with a stockpile of munitions—including missiles, aerial bombs, and possibly artillery rockets—that can be used to deliver CW agents.

North Korea

North Korea's nuclear weapons and missile programs pose a serious threat to the United States and to the security environment in East Asia, a region with some of the world's largest populations, militaries, and economies.

North Korea's long-range ballistic missile capabilities have advanced rapidly during the last year. The increased pace of this emerging threat required the United States to adapt its homeland defense capabilities. North Korea displayed what appeared to be a road-mobile, intercontinental ballistic missile (ICBM) in April 2012, which it may have taken initial steps to deploy, and announced in February 2013 that it had conducted its third nuclear test. North Korea also used its Unha-3, based on the Taepo Dong-2 ICBM, to put a satellite in orbit in December 2012, thus demonstrating long-range missile technology, and may conduct additional missile tests in the near future.

These programs demonstrate North Korea's commitment to develop long-range missile technology that could pose a direct threat to the United States. North Korea's efforts to produce and market ballistic missiles raise broader regional and global security concerns, by threatening the United States' allies and partners and increasing our concerns about ballistic missile technology proliferation

HOMELAND DEFENSE

The U.S. Homeland is currently protected against potential limited ICBM attacks from States like North Korea and Iran by the Ground-based Midcourse Defense (GMD) system. This system consists of Ground-Based Interceptors (GBIs), early-warning radars, sea-based radar systems, and a sophisticated command and control architecture.

We are committed to maintaining an advantageous position vis-a-vis the threats from North Korea and Iran. This requires continued improvement to the GMD system, including enhanced performance by the GBIs and the deployment of new sensors.

We have also developed and maintained a hedge strategy within our GMD program to address possible delays in the development of new missile defense systems and the possibility that the projected ICBM threat could begin to emerge faster or in larger numbers. This desire to maintain a hedge led to decisions in previous budgets to complete eight additional silos in Missile Field 2 and maintain six silos originally slated for decommissioning in mothball status in Missile Field 1 at Fort Greely, AK. Additionally, we continued the development of the two-stage GBI.

The steps we have taken in the fiscal year 2014 budget request will help to ensure that the United States possesses the capability to counter the projected threat for the foreseeable future. The budget maintains funding for ongoing efforts to improve the GMD system, such as:

- a GBI reliability improvement program, which includes the rigorous testing of the Capability Enhancement-II version of the GBI kill vehicle;
- upgrades to the Command, Control, Battle Management, and Communications system;
- emplacement of an additional In-Flight Interceptor Communications System Data Terminal on the U.S. east coast by 2015; and
- upgrades to the Early Warning Radars at Clear, AK, by 2017, and Cape Cod, MA, by 2018.

As a result of the increasing threat from North Korea and delays due to funding cuts to the SM–3 IIB program, the President decided to exercise the hedge options described below. DOD is implementing the President's decision to strengthen the U.S. Homeland missile defense posture, as announced by Secretary of Defense Hagel on March 15, 2013.

First, DOD will deploy eight additional GBIs in the existing silos in Missile Field 2 in Fort Greely, AK. Second, DOD will refurbish and harden the six mothballed silos in Missile Field 1 at Fort Greely and then emplace six additional GBIs in the refurbished silos. The combination of these steps will add 14 interceptors to the GMD system for a total of 44 deployed GBIs defending the U.S. Homeland. When these 14 additional GBIs are deployed in 2017, we will have increased the number of GBIs by nearly 50 percent.

Third, DOD will evaluate at least three locations, and prepare environmental impact statements (EIS), for a potential additional GBI site in the continental United States. Although the administration has not decided to proceed with an additional GBI site, if such a decision were made in the future, doing this work now would shorten the timeline for construction.

Fourth, in order to maintain a robust testing program and sufficient operational spares, DOD will procure 14 additional GBIs to replace those test and spare GBIs that will now be deployed in Fort Greely, AK.

Fifth, with the support of the Japanese Government, the United States will deploy an additional AN/TPY–2 radar in Japan. This will provide improved early warning and tracking of any missile launched from North Korea at the United States, and improve regional defenses, including the protection of Japan.

Sixth, DOD is restructuring the Standard Missile (SM)–3 IIB program into a technology development program focusing on common kill vehicle technology for both the GBI and the SM–3 family of interceptors. Focusing on next generation kill vehicle technology development will improve our ability to address emerging threats and thus ensure protection of the United States, our allies and partners, and our deployed forces overseas. By consolidating future kill vehicle technology development efforts, MDA will work with industry primes and suppliers to define the best technical approach for a modular, open architecture that yields improvements for reliability and performance at a lower cost.

We had planned to deploy the SM–3 IIB for the defense of the United States from Aegis Ashore sites in Europe. The timeline for deploying this program, however, had been delayed to at least 2022 due to funding reductions from the requested amount. As a result, we have decided to shift resources from this program to fund the additional GBIs, as well as new advanced kill vehicle technology. This step will allow us to improve our defense against missiles from Iran sooner than we otherwise would have, while also providing additional protection against the North Korean threat. As a result, no money is being requested in fiscal year 2014 for the SM–3 IIB program.

DOD also determined that the continued development of the Precision Tracking Space System (PTSS) was too high-risk in terms of budget and schedule, and is terminating the program. We will continue to evaluate options to determine the most effective way to meet our missile defense sensor requirements.

REGIONAL MISSILE DEFENSE

DOD's budget request for fiscal year 2014 continues to implement regional approaches that are tailored to the unique deterrence and defense requirements of Europe, the Middle East, and Asia-Pacific regions. These regions vary considerably in their geography, history, and character of the threat faced, and in the military-to-military relationships on which we seek to build cooperative missile defenses. Because the demand for missile defense assets within each region over the next decade will exceed supply, the United States is developing and fielding capabilities that are mobile and capable of being redeployed to different locations as necessary.

Missile defense is an integral part of a comprehensive U.S. effort to strengthen regional deterrence architectures, and plays a central role in the strategic guidance DOD released in January 2012.

Phased Adaptive Approach Implementation: Europe

The elements of the first phase of the European Phased Adaptive Approach (EPAA) are in place. We have maintained a sea-based missile defense presence in the region since March 2011. An AN/TPY–2 radar was deployed to the Turkish military base at Kürecik in 2011. Additionally, associated command and control capabilities, such as the U.S. Air Operations Center at Ramstein Air Base, Germany, are now in operation.

In Phase 2, the architecture will be expanded with a land-based SM–3 site in Romania, and with an upgraded Aegis Ballistic Missile Defense (BMD) Weapons System and SM–3 Block IB interceptors that will be deployed on land and at sea. The Ballistic Missile Defense Agreement with Romania entered into force in December 2011, so the groundwork has been set for the site to become operational in the 2015 timeframe. Ground breaking on that site will occur later this year.

We have also taken steps to meet the requirement in the EPAA for sea-based BMD capabilities. In 2011, Spain agreed to host four U.S. Aegis destroyers at the existing naval facility at Rota. These multi-mission ships will support the EPAA, as well as other U.S. European Command and NATO maritime missions. The first two ships are scheduled to arrive in 2014, and the final two ships will arrive in 2015.

In Phase 3, a second land-based SM–3 site will be deployed in Poland in the 2018 timeframe. The more capable SM–3 Block IIA interceptors will be deployed on land and at sea, extending coverage to all NATO allies in Europe. The ballistic missile defense agreement with Poland entered into force in September 2011.

The restructuring of the SM–3 IIB program to focus on the development of common kill vehicle technology means that we are no longer planning for Phase 4 of the EPAA, the primary purpose of which had been to augment missile defense protection of the United States from a site in Europe. As Secretary Hagel emphasized in his announcement in March, our commitment to NATO missile defense "remains ironclad" as demonstrated by our strong support for the BMD capabilities either already deployed, or being developed for Phases 1 through 3 of the EPAA. Phase 3 will still be capable of providing coverage of all European NATO territory. We have discussed this decision with our NATO allies, and the initial reaction has been positive.

NATO Missile Defense Implementation

As we continue to implement the EPAA, we are also supporting the President's commitment to contribute the EPAA capabilities to NATO missile defense. We are working in close collaboration with our NATO allies to develop an advanced network of sensors and interceptors—on land and at sea—to protect NATO territory.

This administration has made the missile defense protection of Europe a central feature of transatlantic security policy. At the 2010 NATO Summit in Lisbon, Portugal, President Obama and his fellow NATO Heads of State and Government approved a new Strategic Concept, which took the historic step of committing to the defense of European NATO populations and territory against the growing threat of ballistic missiles. At the 2012 NATO Summit in Chicago, the assembled leaders announced that the Alliance had achieved an interim BMD capability—in other words, an operationally meaningful ballistic missile defense capability.

The United States and our NATO allies have worked together to make significant progress on the development of collaborative, networked missile defense systems. Vital command-and-control capabilities for missile defense are now operational. The NATO command-and-control backbone, the Active Layered Theater Ballistic Missile Defense System, has reached an interim operational capability, and will evolve toward full capability between 2018 and 2020.

We continue to carry out exercises designed to hone our Alliance missile defense capabilities. A key missile defense exercise involving NATO is Nimble Titan, a biennial, global campaign. The Nimble Titan 12 exercise included 14 participant nations—including the United States, many NATO countries, Japan, Australia, and the Republic of Korea.

As we begin planning for Nible Titan 14, which begins later this year and will carry into 2014, 21 nations have already signed on to participate. Nimble Titan 14 will include tabletop exercises involving threats in Northeast Asia and Southwest Asia, as well as a capstone event involving all participants on a global scale.

Phased Adaptive Approaches in Other Regions

We are also working to implement the principles of the phased adaptive approach in the Asia-Pacific region and the Middle East region, building on the existing foundations of U.S. defense cooperation in these regions. These approaches must be tailored to the unique mix of threat and geography in each region. In the Asia-Pacific region, the security environment is largely maritime in character, with vast distances between some of the states that make up the region, requiring both maritime assets and defenses against longer-range missiles. The Middle East region is far more compact, and the threat comes from missiles of short- and medium-range. The footprint of U.S. military presence is different in each region, and will evolve in different ways over the coming decade. The potential threat to the U.S. Homeland from regional actors varies, and the role that regional defenses plays in protection of the United States and our deployed forces and assets will change as well.

These regional approaches to ballistic missile defense should allow stronger partnerships with our allies and partners in meeting emerging security challenges, and provide opportunities to build partner capacity.

INTERNATIONAL COOPERATION

Europe

The United States encourages continued allied contributions to NATO missile defense. EPAA host nations (Poland, Romania, Spain, and Turkey) will provide the basing rights and external security for the facilities where EPAA assets are located. The Netherlands has committed to spend up to 250 million Euro to upgrade the SMART–L radars on four of their frigates so they can contribute to NATO BMD in the 2018 timeframe. The Netherlands and Germany have also committed Patriot PAC–3 systems to NATO missile defense, including through the ongoing NATO deployment in defense of Turkey. France and Italy intend to contribute the SAMP/T air and missile defense system, scheduled to become operational in 2013, to NATO BMD. France is also planning to provide its Spirale satellite detection system and a long-range radar. Looking to the future, the United States will continue to encourage its NATO allies to do even more to cooperate and invest in missile defense. Several allies have modern surface combatant ships that could be upgraded with a BMD sensor or interceptor capability. A number of NATO allies also have proposed concepts for a multinational interceptor "pool" concept, whereby allies collectively purchase interceptors such as the SM–3 to support NATO missile defense. Additionally, some allies are considering the purchase of Patriot PAC–3.

Asia-Pacific

The cornerstone of our security and diplomacy in the region has historically been our very strong bilateral alliances, including with the Republic of Korea, Japan, and Australia. All three of these nations play an important role in our regional efforts to achieve effective missile defense.

The Republic of Korea obviously has an immediate, proximate stake in preventing missile strikes from the North. We have worked very closely with the ROK to ensure that we maintain the capacity and interoperability to do just that. The United States deploys PAC–3 batteries in South Korea to defend U.S. and South Korean forces.

In addition, the ROK is taking steps to enhance its own air and missile defense systems, which include sea- and land-based sensors and Patriot PAC–2 batteries.

We have been consulting closely with the ROK about how it can upgrade its missile defense capabilities. Enhanced intelligence, surveillance, and reconnaissance through the potential South Korean purchase of Global Hawk would contribute to a more robust posture. We are mutually committed to sustain and strengthen protection against the North Korean missile threat.

Japan has acquired its own layered missile defense system, which includes Aegis BMD ships with Standard Missile-3 interceptors, PAC–3 batteries, early-warning radars; and sophisticated command-and-control systems. In addition, Japan is a critical international partner for BMD development. One of our most significant cooperative efforts with Japan is the co-development of an advanced version of the SM–3 interceptor, the SM–3 Block IIA. In addition, we have deployed an AN/ TPY–2 radar—which provides early warning and tracking—to Japan, and, as previously mentioned, we plan to deploy a second AN/TPY–2 to Japan.

With regard to Australia, we signed a memorandum of agreement on missile defense cooperation in 2004, and have formed a close partnership on research and development—most notably with regard to sensors. In addition, Australia is involved in one of our two trilateral discussions on missile defense in the Pacific involving the United States, Australia, and Japan; the other is with the United States, the Republic of Korea, and Japan.

These trilateral discussions are part of our efforts to expand international missile defense cooperation, strengthen regional security architectures, and build partner capacity. We have already seen the value of these multilateral approaches. For example, Japan, the Republic of Korea, and the United States successfully tracked two near-simultaneous launches of ballistic-missile targets as part of the multilateral Pacific Dragon exercise last summer. In December 2012, we cooperated very closely in tracking the North Korean Unha-3 space launch.

Going forward, we will continue to emphasize the importance of developing a regional ballistic missile defense system that includes the sharing of sensor data among allies.

Middle East

The United States maintains an exceptionally strong defense relationship with Israel, including on missile defense, which has resulted in one of the most comprehensive missile defense architectures in the world. Israeli programs such as Iron Dome, the David's Sling Weapon System, and the Arrow Weapon System, in conjunction with operational cooperation with the United States, create a multi-layered architecture designed to protect the Israeli people from varying types of missile threats. Missile defense figured prominently in the Austere Challenge exercise we conducted with Israel in the fall of 2012, the largest U.S.-Israeli military exercise in history.

The United States is also working with a number of Gulf Cooperation Council (GCC) States on missile defense, including supporting the purchase of missile defense systems through the Foreign Military Sales program. For example, the United Arab Emirates is procuring the Terminal High Altitude Area Defense system. This is in addition to the UAE's earlier purchase of Patriot systems. These capabilities will significantly enhance the UAE's defense against ballistic missile attack.

This past year, U.S. Air Force Central Command initiated a series of regular exchanges between United States and GCC air defense officers at the Combined Air Operations Center located at Al Udeid Air Base in Qatar.

Finally, at the inaugural U.S.-GCC Strategic Cooperation Forum in Riyadh, GCC foreign ministers and then-Secretary of State Clinton highlighted the threat that ballistic missiles pose against critical military and civilian infrastructure. One result of these high-level talks was that the ministers agreed on the need to deepen U.S.-GCC BMD cooperation which they see as an essential element of their effort to promote peace and stability in the region.

Russia

The United States continues to seek cooperation with Russia on missile defense, both bilaterally and with our allies through the NATO-Russia Council. We are pursuing this cooperation because it would be in the security interests of all parties and could strengthen the defensive capabilities of both NATO and Russia. Allies embraced such cooperation with the hope of advancing broader strategic partnership with Russia. The United States has pursued missile defense cooperation with Russia with the clear understanding that we will not accept constraints on our missile defense systems, we will implement the EPAA, and Russia will not have command and control over NATO ballistic missile defense efforts. NATO would be responsible for the defense of NATO, and Russia would be responsible for the defense of Russia.

The United States has kept Congress and our allies informed about our efforts with Russia on missile defense cooperation, which have included the proposal to establish missile defense cooperation centers in Europe. The United States has been open and transparent with Russia about our plans for European missile defenses, and explained in detail why U.S. missile defense systems in Europe will not negate the Russian strategic nuclear deterrent.

Although we have had no breakthroughs, the administration remains committed to pursuing substantive missile defense cooperation with Russia because it remains in our security interests to do so.

CONCLUSION

The ballistic missile threat—to the United States, to our allies and partners, and to our forces overseas—is evolving, and so we must adapt our responses to mitigate this threat.

I have touched upon a number of policies that we and our allies have pursued to address and counter this threat. We have had some very significant successes over the last several years, but this administration has emphasized from the beginning that we cannot afford to stand still. To the contrary, we need to re-evaluate the threat continually and adapt as necessary. The President's budget request for fiscal year 2014 reflects DOD's goals of retaining the flexibility to adjust, and to enhance our defenses as the threat and as technologies evolve. Our most vital security commitments—the defense of the United States and the protection of our allies and partners and our forces around the world—demand nothing less.

I want to thank you for having me here today, and I look forward to your questions.

Senator UDALL. Thank you, Secretary Creedon.
Dr. Gilmore.

STATEMENT OF HON. J. MICHAEL GILMORE, DIRECTOR, OPERATIONAL TEST AND EVALUATION, DEPARTMENT OF DEFENSE

Dr. GILMORE. Mr. Chairman, Senator Fischer, members of the committee, I just want to emphasize briefly that we are incorporating increasing amounts of operational realism and therefore complexity in the missile defense tests that we do. That's important so that everyone involved from the President on down to the combatant commanders and the people who operate the system can understand what it truly can and cannot do.

The most recent example of that was Flight Test Integrated-01, conducted late last year. That involved the simultaneous, nearly simultaneous intercept by Aegis, THAAD, and Patriot of both ballistic missile and air-breathing targets. There was extensive participation by the combatant commands in that test and they used it to develop tactics, techniques, and procedures that are being put into real use in U.S. Central Command today.

We'll follow that up with the first multi-system operational test, Flight Test Operational-01 (FTO–01), later this year, involving both Aegis and THAAD. We're going to do the same thing with the ground-based missile defense system. Given what we learned recently with the successful non-intercept test, we will probably conduct early in fiscal year 2014 an intercept test using the Capability Enhancement II kill vehicle, which is the one that had the failure a couple of years ago to intercept. We're also going to do an intercept test using the Capability Enhancement I kill vehicle, which will comprise the majority of the fleet for some time, within about a month.

Thereafter, in fourth quarter of fiscal year 2015 we will conduct a test in GMD of a true ICBM-class target, and we will follow that up with tests incorporating increasing realism, including realistic countermeasures, salvo engagements, multiple simultaneous engagements.

So I strongly support the deliberate, rigorous test program that Admiral Syring and the MDA are executing. That program allows the time needed to do rigorous pre- and post-test analysis. It enables us to learn and correct problems. In fact, although it may sound somewhat ironic and counterintuitive, to me the value of the test program is demonstrated most by the failures that have occurred, because those failures that have occurred within the last couple of years for both Aegis, Standard Missile, and the GBI, would not have been discovered if not for the test program. Modeling and simulation would not have uncovered those problems.

Thank you and I will be happy to answer your questions.

[The prepared statement of Dr. Gilmore follows:]

PREPARED STATEMENT BY DR. J. MICHAEL GILMORE

Chairman Udall, Senator Sessions, distinguished members of the subcommittee, thank you for the opportunity to discuss missile defense test planning, processes, and programs, including my assessment of the Ballistic Missile Defense System (BMDS).

Over the last year, Aegis Ballistic Missile Defense (BMD), Patriot, and Terminal High-Altitude Area Defense (THAAD) each demonstrated additional progress toward Short-Range Ballistic Missile (SRBM) threat class capability, even though Aegis BMD suffered a Standard Missile-3 Block IA interceptor failure during a flight test late in the year. For the first time, THAAD demonstrated progress toward Medium-Range Ballistic Missile (MRBM) threat class capability when it successfully destroyed a medium-range air-launched target. Ground-based Midcourse Defense (GMD) did not conduct any intercept flight testing during the period and did not demonstrate progress toward Intermediate-Range Ballistic Missile (IRBM) or Intercontinental Ballistic Missile (ICBM) threat class capability. However, GMD did conduct an interceptor only flight test in January 2013 as part of its return to intercept effort. That test demonstrated the potential for selected design changes made to the Capability Enhancement II kill vehicle to correct problems that caused previous test failures. Command, Control, Battle Management, and Communications (C2BMC) demonstrated the capability to control two operationally-deployed AN/TPY–2 radars in Forward-Based Mode (FBM), using operational communications architectures; personnel; and tactics, techniques, and procedures.

The Missile Defense Agency (MDA) element flight testing included three Aegis BMD intercept tests and one THAAD operational flight test. U.S. Army testing of Patriot was more extensive, including an operational test that was conducted from May 2012 to January 2013. Aegis BMD completed the first two successful intercepts of SRBM targets by the new Standard Missile-3 Block IB interceptor using software build 4.0.1. In February 2013, Aegis BMD conducted the first engagement using remote data from the Space Tracking and Surveillance System. THAAD successfully completed its Initial Operational Test and Evaluation (IOT&E) by simultaneously destroying a foreign military acquisition SRBM and an MDA-developed target with MRBM characteristics flying a short-range trajectory. Patriot successfully completed five different intercept flight tests against SRBMs using a variety of Patriot interceptors including the new Missile Segment Enhancement interceptor under development. Patriot also conducted intercept flight testing during the period for a Foreign Military Sales customer. In addition, the MDA continued its ground test program.

Significant to a system-level characterization of the BMDS, the MDA conducted the first flight test of a regional BMD system. This test included Aegis BMD, Patriot, and THAAD, as well as C2BMC and an AN/TPY–2 (FBM), which comprised the most complex BMD flight test ever attempted in the history of the DOD. Conceived as a risk reduction test for future operational tests, Flight Test Integrated-01 (FTI–01) included basic system-level integration, but not true layered defense, as the test was designed such that the weapon elements could only engage their intended targets. Because of this, the weapon elements basically operated independently of one another. Nevertheless, the Space-Based Infrared System/Defense Support Program participated in this test and the elements exchanged track data with each other and received acquisition cues from the AN/TPY–2 (FBM) radar via C2BMC. The test design featured near-simultaneous Aegis BMD and THAAD intercepts, a THAAD first-time engagement of an MRBM, a Patriot engagement of an SRBM in the presence of upper-tier post-intercept debris, and Aegis BMD and Patriot defending against cruise missile attacks. While the Standard Missile-3 Block IA interceptor missed its target, the Standard Missile-2 and the three other interceptors achieved successful intercepts. Soldiers performed command and control functions from the Air and Space Operations Center at Hickam Air Force Base, Hawaii. In FTI–01, for the first time, three missile defense weapon elements and an external sensor operated in the same theater engaging a small raid of ballistic missiles and air-breathing targets.

Since Flight Test Standard Missile (FTM)-15 in April 2011, Aegis BMD has experienced one test anomaly and two flight test failures. During FTM–15, the Standard Missile-3 Block IA Third Stage Rocket Motor experienced a failure in a critical component, leading to unexpected behavior just prior to achieving a successful intercept. The faulty component, common to both the IA and IB interceptors, was subsequently redesigned and flown successfully in FTM–18. During FTM–16 Event 2 in September 2011, a catastrophic failure of the Third Stage Rocket Motor resulted in a failure to intercept. The MDA determined the cause to be an issue with one of the firing parameters and made the necessary software modifications to mitigate the issue. Subsequently, the MDA conducted numerous ground firings of the Third Stage Rocket Motor to verify that it now functions properly and it intends to use the newly-adjusted firing parameter in FTM–19 in May of this year. This was also an issue common to both the IA and IB interceptors. Finally, the MDA is still investigating the cause of the Standard Missile-3 Block IA interceptor failure to intercept during FTI–01.

The test program for fiscal year/calendar year 2012 was adequate to support the development of the regional BMDS. The need to determine root cause of the FTG–06a failure, as well as develop, analyze, and perform ground tests of the means to correct the failure precluded GMD intercept flight testing during 2012. The MDA conducted tests as planned in the IMTP, Versions 11.2, 12.1, and 12.2 approved by the MDA Director and myself in August 2011, March 2012, and June 2012 respectively. However, except for the THAAD IOT&E, all key flight tests scheduled in IMTP 11.2 moved to later calendar quarters in IMTP 12.1, frequently a full year or more later. All of these changes except one were primarily the result of previous flight test failures and the ensuing investigations that required laboratory and ground testing, hardware corrections, and software changes. The exception was the MDA changing the first operational test of the BMDS into FTI–01 as a risk reduction test with the operational test re-inserted in the schedule a year later.

The test frequency across all of the BMDS elements remains consistent in the recently approved IMTP version 13.1 as compared with the earlier 12.2 version. For GMD, the MDA maintained the flight test frequency, averaging one flight test per year, a test pace that allows sufficient time to analyze the terabytes of data generated during GMD flight tests. Flight Test Ground-based Interceptor-07 (FTG–07) is planned for later this year, real-world events permitting, and will be flown using the failed intercept FTG–06a profile and a Capability Enhancement-I Exoatmospheric Kill Vehicle with an Aegis BMD forward sensor providing a tracking cue through C2BMC. This will be the second of three risk reduction flights for the GMD return to intercept. FTG–06b is being planned for late this calendar year and will complete the GMD return to intercept plan. The MDA will conduct their first engagement of an ICBM, with the target flying a range of greater than 5,500 kilometers, in fiscal year 2015. This will also be the first GMD salvo test of two interceptors fired at a single target. The MDA will conduct a multiple simultaneous engagement of two interceptors on two targets in fiscal year 2018.

In the case of Aegis BMD 3.6.1 and THAAD, sufficient data now exist to calculate quantitative estimates of the probability of engagement success for the tested battlespace (which is less than the full intended battlespace) of the two weapon systems. The probability of engagement success estimates for these two weapon systems are included in my classified 2012 Assessment of the BMDS.

Many of the models and simulations used in the ground tests are still not accredited for performance assessment, thereby limiting quantitative assessments based on their results. Some portions of the battlespace where data are lacking cannot be assessed. Examples include high closing velocity associated with longer range targets for Aegis BMD, salvo intercept time spacing for GMD since it has not yet attempted a salvo launch, and launch on remote track for THAAD. My office and MDA are working to assure the Integrated Master Test Plan (IMTP) supports BMDS modeling and simulation by providing the test data required for rigorous verification, validation, and accreditation (VV&A). However, model and simulation VV&A to support comprehensive quantitative performance assessments will, in many instances, require several more years to complete.

My comments to this committee during my testimony of the last 4 years, regarding the IMTP development process, remain accurate. The Director of MDA, Vice Admiral Syring, has continued to pursue a rigorous IMTP development process that has produced a rigorous and well-justified set of tests. My office continues to be involved throughout the semi-annual review and revision process leading to each update of the IMTP. This process has worked well during the preparation of the seven previous plans, including the most recent IMTP (version 13.1), that I approved jointly with Admiral Syring in March. The process has enabled each version of the IMTP to be revised in a timely manner consistent with policy changes, flight test results (including unsuccessful intercepts) such as those I have mentioned previously, or, changes in budgetary resources. The current IMTP is a rigorous plan for obtaining the test information needed to assess BMDS performance quantitatively.

However, as I noted in my previous testimony, the IMTP continues to be success-oriented. The rigorous testing incorporated in the IMTP will inevitably lead to flight test failures. These failures, although often perceived as setbacks, provide information that is absolutely critical to assuring that our ballistic missile defenses will work under realistic and stressing conditions. The IMTP does not, however, include plans for backup or repeat tests that would be needed in the event of flight test mission failures. Therefore, the effects of unsuccessful tests, such as the earlier FTG–06a and FTM–16 Event 2 failures, need to be mitigated through future updates of the IMTP. Thus far, the semi-annual revision process has allowed flexibility in making the necessary adjustments when needed.

CONCLUSION

The ability to conduct comprehensive quantitative assessments of BMDS capability across the full battlespace for each of the elements is still a number of years away. However, BMDS testing has now produced sufficient data to enable a quantitative assessment of capability for both THAAD and the currently fielded Aegis BMD system covering the limited portions of their tested battlespace. Executing the planned testing in the IMTP will enable the collection of data needed to ultimately validate the models and simulations required to perform those assessments and to demonstrate capability across the full battlespace.

Senator UDALL. Thank you, Dr. Gilmore.

Lieutenant General Formica.

STATEMENT OF LTG RICHARD P. FORMICA, USA, COMMANDER, U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND/ARMY FORCES STRATEGIC COMMAND, AND COMMANDER, JOINT FUNCTIONAL COMPONENT COMMAND FOR INTEGRATED MISSILE DEFENSE

General FORMICA. Mr. Chairman, Senator Fischer, members of the committee: First, Mr. Chairman, thank you for your kind words. It's been an honor and a privilege to serve the United States of America in uniform and to have the opportunity to appear before this subcommittee on a couple of occasions. I would like to add my thanks to you and all of the committee for your support of our soldiers, sailors, airmen, marines, civilians, and families.

My intent today is twofold: to highlight the missile defense operations and the force provider role that U.S. Army Space and Missile Defense Command (SMDC), and the role that the Joint Functional Component Command for Integrated Missile Defense (JFCC IMD) plays as an operational integrator of joint missile defense capabilities for STRATCOM.

At SMDC, to accomplish our assigned mission we focus on three core tasks. In operations, we provide trained and ready space and missile defense forces and capabilities to the Nation. Those are capabilities we provide today. In capability development, we build the future space and missile defense forces. Those are the capabilities we'll provide tomorrow. In material development, we research, test, and integrate space, missile defense, and other related technologies. Those are the capabilities we'll provide the day after tomorrow.

As the Operational and Functional Component Command of STRATCOM, at JFCC IMD we perform key mission tasks to facilitate the execution of STRATCOM's missile defense responsibilities. Those tasks include synchronizing operational level planning for missile defense; providing operational support and asset management for missile defense forces; integrate joint ballistic missile defense (BMD) training, exercises, and test activities with the warfighters; and to advocate for future capabilities.

With the combined efforts of DOD and with the support of Congress, progress has been made to evolve global missile defense capabilities, to strengthen the defense of the homeland, and to advance our capability to defend our deployed forces, allies, and friends abroad. During this period of fiscal uncertainty, this committee's continued support of missile defense and the soldiers, sailors, airmen, marines, and civilians who develop, deploy, and operate those missile defense systems remains essential.

I look forward to answering any of your questions. Thank you.
[The prepared statement of General Formica follows:]

PREPARED STATEMENT BY LTG RICHARD P. FORMICA, USA

Mr. Chairman, Ranking Member Sessions, and distinguished members of the subcommittee, thank you for your continued support of our soldiers, civilians, and families. It is an honor and privilege to again testify before this Subcommittee. Today I appear before you, bringing both a joint and Army perspective, for effective missile defense capabilities. We appreciate this subcommittee's continued support of the Army, the U.S. Strategic Command, the Department of Defense, and the missile defense community.

My three responsibilities remain unchanged from my previous appearances before you. First, as the Commander of the U.S. Army Space and Missile Defense Command (USASMDC), I have title 10 responsibilities to train, maintain, and equip space and global ballistic missile defense forces for the Army. Second, I am the Army Service Component Commander (ASCC) to the U.S. Strategic Command (STRATCOM) as the Commander of the Army Forces Strategic Command (ARSTRAT). I am responsible for planning, integrating, and coordinating Army forces and capabilities in support of STRATCOM missions. Third, I serve as the Commander of STRATCOM's Joint Functional Component Command for Integrated Missile Defense (JFCC IMD), synchronizing Joint operational-level planning and global missile defense operations support. It is an honor to testify with these distinguished witnesses who bring missile defense capabilities to our Nation, forward deployed forces, friends, and allies.

During last year's appearance, my intent was threefold: to highlight USASMDC/ARSTRAT's missile defense force provider responsibilities to the Army and the geographic combatant commanders (GCCs); to outline JFCC IMD's role as an operational integrator of joint missile defense for STRATCOM; and to summarize the status and capabilities of the major Army air and missile defense programs of record.

Since last year's hearing, there have been significant changes in both the strategic and fiscal landscapes. Today, I will briefly highlight the ramifications to the missile defense arena resulting from these changes and update the subcommittee on our continuing progress that directly contributes to the Nation's ability to defend against ballistic missiles, both today and tomorrow.

EVOLVING STRATEGIC AND FISCAL ENVIRONMENT

In January 2012, the latest U.S. Defense Strategy, Sustaining U.S. global Leadership: Priorities for 21st Century Defense, was released. Missile defense priorities are identified, within the global security context of the new strategy that, among other objectives, outlines the DOD's rebalancing toward the Asia Pacific region and renews emphasis on building partner capacity. The strategy recognizes that adversaries, using asymmetric capabilities to include ballistic and cruise missiles, "have the potential to pose catastrophic threats that could directly affect our Nation's security and prosperity." The ongoing North Korea ballistic missile situation demonstrates this strategy concern.

As this subcommittee is well aware, the ballistic missile threat from regional actors, such as North Korea and Iran, is not new. The threat is increasing both quantitatively and qualitatively and is likely to continue to do so over the next decade. In an environment of decreasing resources, we must be prepared to quickly adapt to confront varying threat environments. As we will never have enough resources, neither missile defense system assets nor the force structure, to counter the regional growing threat, our approach has been to take a holistic approach and invest in assets to address the most pressing threat.

> "Potential enemies will increase the range, accuracy, and lethality of direct and indirect fire weapons capabilities . . ."—The Army Capstone Concept, December 2009

In conjunction with the objectives of the current U.S. Defense Strategy and to address present adversary threats, STRATCOM and the Army continue to provide homeland and regional missile defense capabilities. The recent announcement to deploy a Terminal High Altitude Area Defense (THAAD) battery to Guam and the positioning of the Sea-Based X-Band (SBX) Radar within the Pacific region demonstrate our ability to quickly increase the readiness status of GMD forces and deliver capabilities to address the North Korean ballistic missile threat to our deployed forces and regional allies. Within the missile defense community, we continue

to deploy technologically advanced assets to counter the threat of North Korean aggression, promote stability, and support our Nation's security interests. We also continue to assist the regional partners with missile defense capabilities they bring to bear. While retaining our number one priority to defend the homeland against a limited ballistic missile attack, we will continue to deter and defend against the more prevalent regional ballistic missile threats. In summary, the complexity of the strategic environment, the technological advances of the threat, and fiscal realities require cost efficient and operationally effective methods of integrating current and future capabilities.

THE WORKFORCE—OUR GREATEST ASSET

During DOD Space testimony before this subcommittee a few weeks ago, I felt it appropriate to highlight our workforce. I believe it remains appropriate to do so again today. At USASMDC/ARSTRAT, as is the case Army-wide, our people are our most enduring strength. In the missile defense arena, many of our soldiers, civilians, and contractors provide critical support to the warfighter 24/7/365. This support extends to warfighters, both stationed in the Homeland and serving abroad. Within our command, we continuously strive to ensure our entire team remains viable, strong, and capable.

The ongoing fiscal uncertainties and the impacts of sequestration to the USASMDC/ARSTRAT civilian workforce continue to cause concern for me and the workforce. I have four concerns. First, I am concerned about the impact of a potential furlough, which has caused angst, impacted morale, and is expected to place personal hardships on much of the workforce. Second, the civilian hiring freeze is creating vacancies in the workforce. This impacts our ability to build our bench and will have longer-term impacts on the ability to provide space capabilities to the warfighter. Third, the elimination of our temporary and term employees, some of which are our future engineers, is impacting the next generation of civilian professionals. Fourth, we are consuming our future readiness by reducing the professional development opportunities for our civilian workforce. We will work to mitigate these issues and reduce their impact on our ability to provide capabilities to the warfighter.

ACCOMPLISHMENT OF OUR THREE CORE MISSILE DEFENSE TASKS

USASMDC/ARSTRAT, a force provider for missile defense capabilities, is one command that is split-based with dispersed locations around the globe that are manned by multi-component soldiers, civilians, and contractors. I remain very proud of the capabilities they deliver to the warfighter. As our command name implies, USASMDC/ARSTRAT has a vital role in missile defense; JFCC IMD, STRATCOM, and GCCs around the globe, to include U.S. Northern Command (NORTHCOM), leverage the capabilities of our command. Our title 10 responsibilities include operational as well as planning, integration, control, and coordination of Army forces and capabilities in support of STRATCOM's missile defense mission. USASMDC/ARSTRAT also serves as the Army's global operational integrator for missile defense, the Army's proponent for global missile defense force modernization, and has a unique technical center to conduct missile defense related research and development in support of Army title 10 responsibilities.

To accomplish our assigned missions, we remain focused on three core tasks:

- To provide trained and ready space and missile defense forces and capabilities to the warfighter and the Nation—our operations function that addresses today's requirements.
- To build future space and missile defense forces—our capability development function that is responsible for meeting tomorrow's requirements.
- To research, test, and integrate space, missile defense, and related technologies—our materiel development function that aims to advance the Army's and warfighter's missile defense capabilities the day-after-tomorrow.

Three Core Tasks—Addressing Requirements of Today, Tomorrow, and the Day-After-Tomorrow

Today's Operations Task—Provide Trained and Ready Missile Defense Forces and Capabilities:

Our first core task is to provide trained and ready space and missile defense forces and capabilities to the GCCs and the warfighter—our operations function that addresses today's requirements. For missile defense, USASMDC/ARSTRAT Soldiers, serving on the homeland and in forward deployed locations, most remote and austere, operate the Ground-Based Midcourse Defense (GMD) consoles and the Army

Navy/Transportable Radar Surveillance Forward-Based Mode (AN/TPY–2 FBM) radars. A summary of the critical missile defense capabilities provided daily by our missile defense professionals is highlighted below.

Support to Global Ballistic Missile Defense (BMD):

Soldiers from the 100th Missile Defense Brigade, headquartered at Colorado Springs, CO, and the 49th Missile Defense (MD) Battalion, headquartered at Fort Greely, AK, remain ready, 24/7/365, to defend our Nation and its territories from a limited intercontinental ballistic missile attack. Under the operational control of NORTHCOM, Army National Guard and Active component soldiers operate the GMD Fire Control Systems located at the Missile Defense Element in Colorado, the Fire Direction Center in Alaska, and the GMD Command Launch Element at Vandenberg Air Force Base, CA. These soldiers, in conjunction with JFCC IMD and NORTHCOM, also oversee the maintenance of GMD interceptors and ground system components. At the Fort Greely site, 49th MD Battalion military police secure the interceptors and communications capabilities at the Missile Defense Complex from physical threats.

> "Homeland defense and support to civil authorities require strong, steady-state force readiness, to include a robust missile defense capability."—Priorities for 21st Century Defense, January 2012

Support to Regional Capabilities:

The 100th MD Brigade is also a force provider to other GCCs for the AN/TPY–2 Forward-Based Mode (FBM) radar detachments and provides subject matter expertise on training and certification of the radars' operations. Operational capabilities are present today at strategic locations around the globe.

GMD System Test and Development:

Soldiers from the 100th MD Brigade actively participate in GMD test activities and continue to work with Missile Defense Agency (MDA) developers on future improvements to the GMD system.

Ballistic Missile Early Warning:

Critical to the Joint Force Commander's theater force protection, USASMDC/ARSTRAT continues to provide ballistic missile early warning within various theaters of operations. The 1st Space Brigade's Joint Tactical Ground Station (JTAGS) Detachments, under the operational control of STRATCOM's Joint Functional Component Command for Space, but operated by USASMDC/ARSTRAT space-professional Soldiers, monitor enemy missile launch activity and other infrared events. They provide this essential information to members of the air, missile defense, and operational communities. Our JTAGS Detachments are forward-stationed across critical regions, providing 24/7/365, dedicated, assured missile warning to STRATCOM and other GCCs in support of deployed forces.

Tomorrow's Capability Development Task—Build Future Missile Defense Forces and Capabilities:

Our second core task is to build future missile defense forces—our capability development function. These are the missile defense capabilities we will provide tomorrow. A major component of our capability development function is to train Army soldiers on missile defense systems. During the past year, USASMDC/ARSTRAT trained over 1,500 soldiers and was recertified as an institution of excellence for missile defense training.

The Army uses established and emerging processes to document its missile defense needs and pursue Army and Joint validation of its requirements. As a recognized Army Center for Analysis, USASMDC/ARSTRAT conducts studies to determine how best to meet the Army's assigned missile defense responsibilities. With this information, we develop the Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities (DOTMLPF) domains to mitigate threats and vulnerabilities for the MDA-developed GMD and AN/TPY–2 FBM missile defense systems. This disciplined approach helps to ensure limited resources are applied where warfighter operational utility can be most effectively served.

The Day-After-Tomorrow's Materiel Development Task—Research, Test, and Integrate Missile Defense related Technologies:

In our third core task, USASDMC/ARSTRAT provides critical technologies to address future needs that will enhance warfighter effectiveness—our materiel development function. These are the capabilities we will provide for the day-after-tomorrow. In USASMDC/ARSTRAT, our technology development function is primarily focused

on space and high altitude. While MDA is the principal materiel developer for ballistic missile defense, USASMDC/ARSTRAT has a number of ongoing missile defense related materiel development efforts, to include ongoing research and development of a conventional offensive strike capability to address ballistic missile threats. A brief summary of two of these research and development efforts as well as an overview of an essential Army testing range follows.

Providing Greater Capability to Future Warfighters

High Energy Laser Mobile Demonstrator:

As we have learned often during the last decade plus of conflict, insurgents pose serious dangers to U.S. forward operating bases by employing quick-attack, low-trajectory, rockets, artillery, and mortar (RAM) strikes. The technology objective of the High Energy Laser Mobile Demonstrator (HEL MD) is to demonstrate a solid state laser weapon system that will serve as a complementary resource to kinetic energy capabilities in countering RAM projectiles. This weapon system will also have a significant capability against unmanned aerial systems. An initial demonstration is planned in the near future against short range mortars and unmanned aerial systems. Once completed, and if successful, the HEL MD will consist of a ruggedized and supportable high energy laser with subsystems installed on a tactical military vehicle that will greatly enhance the safety of deployed forces.

Low-Cost Target Development:

The Army is continuing to pursue a technology effort to develop a suite of low cost targets for the Patriot testing program. The intent is to design threat-representative targets at a substantially reduced cost for short-range ballistic missile testing. Each system has unique performance parameters including range, altitude, physical dimensions, and other characteristics tied to the testing requirements. Earlier this month, a Patriot missile defense system successfully intercepted a developmental low-cost target in a test that effectively mimicked an actual threat missile. We will continue to leverage technology advancements in order to realize less expensive targets that are representative of actual threats.

Missile Defense Testing:

USASMDC/ARSTRAT operates the Reagan Test Site at Kwajalein Atoll. Located in the Marshall Islands, the U.S. Army Kwajalein Atoll/Reagan Test Site is critical to testing requirements such as the testing of missile defense capabilities and testing of the U.S. Air Force's strategic ballistic missiles assets. In addition to its testing mission, personnel at the Reagan Test Site conduct continuous operational space surveillance and tracking.

JOINT FUNCTIONAL COMPONENT COMMAND FOR INTEGRATED MISSILE DEFENSE—SYNCHRONIZING MISSILE DEFENSE OPERATIONAL LEVEL PLANNING AND SUPPORT

JFCC IMD, STRATCOM's missile defense integrating element, has been operational for 8 years. Like the other JFCCs, JFCC IMD was formed to operationalize STRATCOM missions and allow the headquarters to focus on strategic-level integration and advocacy. Headquartered at Schriever Air Force Base in Colorado Springs, CO, the JFCC IMD is manned by capable Army, Navy, Air Force, Marine Corps, and civilian personnel.

As the Secretary of Defense (SECDEF) and various combatant commanders have previously testified, the warfighter remains confident in our ability to protect the Nation against a limited ballistic missile attack, even in the face of the changing strategic and fiscal environment. In March, the SECDEF announced the administration's plan to increase the number of ground-based interceptors (GBIs) at Fort Greely from 26 to 40, bringing the total number of deployed GBIs to 44, and to deploy a second AN/TPY–2 FBM radar to Japan. We are working with MDA as it conducts site selection activities for a possible third site in the continental United States as directed by the National Defense Authorization Act for Fiscal Year 2013. An additional site has the potential to further bolster the Nation's capability to defend against threats from North Korea and Iran.

With Priority on Defense of the Homeland, Execute a Holistic Global Missile Defense Plan

The warfighter is working across the military enterprise to increase the integration of existing capabilities in order to maximize efficiency and effectiveness to protect the homeland, our deployed forces, friends, and allies. The key force multiplier is "integration," which is the key mission area of JFCC IMD and directly supports STRATCOM.

STRATCOM has been assigned seven Unified Command Plan (UCP) responsibilities for missile defense. As the operational and functional component command of STRATCOM, JFCC IMD has derived five key mission tasks from the STRATCOM UCP responsibilities:

- Synchronize operational level planning, integrate security cooperation activities, and recommend allocation of forces via the global force management process.
- Conduct operations support and asset management for missile defense forces and provide alternative execution support.
- Integrate Joint BMD training, exercises, and test activities.
- Advocate for future capabilities, conduct analysis and assessments, and recommend the operational acceptance of missile defense capabilities into the architecture.
- Provide information system security and network support to assure a reliable BMDS communications network.

To accomplish each of these five tasks, we maintain close collaborative relationships with the GCCs, MDA, the Services, the Office of the Secretary of Defense (OSD), the Joint Staff, our allies, and our industry partners. Through collaborative processes, we continually add to our deployed capability while gaining operational experience and confidence in our collective ability to defend our Nation, deployed forces, and our friends and allies. Following, I will highlight some of our collaborative efforts to enhance missile defense planning and capabilities for both the homeland and regional architectures.

Expansion and Integration of a Missile Defense Architecture:

As I mentioned earlier, the SECDEF recently directed us to bolster the homeland defense capability and regional missile defense capabilities in response to the changing strategic environment. Over the past year, warfighters operationally deployed two additional AN/TPY–2 FBM radars, moved a Patriot unit to Turkey to support NATO, deployed a Terminal High Attitude Area Defense (THAAD) unit to Guam, and expanded our missile defense collaboration with allies. We have implemented Phase 1 of the European Phased Adaptive Approach (PAA) and continue to address the unique regional threat environments and partnerships to further homeland defense. Given many of the challenges associated with implementation of these architectures, JFCC IMD, supporting STRATCOM as the global synchronizer for missile defense, is collaborating with the GCCs to assess and address the cross regional gaps in the areas of planning, policy, capabilities, and operations to enhance our global defense capabilities. In support of homeland defense, we have ongoing initiatives to inform and provide the vision to maintain our advantageous position in missile defense.

Global BMD Assessment:

While regional phased adaptive approaches mature, and with homeland defense at the forefront, JFCC IMD collaborates closely with the GCCs to assess the level of operational risk associated with the execution of their operational plans given their allocation of BMD capabilities. The overall assessment serves to shape recommendations for global force management and advocacy efforts for future capability investments. We completed the 2012 Global BMD Assessment and the 2013 assessment is underway. The 2012 assessment identified areas where our capabilities can be improved—we continue to pursue affordable courses of actions to enhance our means to counter the threat. For 2013, we are expanding the previous BMD-only assessment to integrate both air and missile defense assets. The expanded assessment will more accurately reflect the way we will fight and the associated operational risks.

> "The United States will continue to defend the homeland against the threat of limited ballistic missile attack"—Ballistic Missile Defense Review, February 2010

With regard to regional threats, JFCC IMD assessments indicate that addressing missile defense threats will remain a challenge. Our analysis, reinforced by the 2012 Global BMD Assessment, reinforces the fact that GCC demands for missile defense capabilities will always exceed the available BMD inventory. We must be able to address some ballistic missile threats before they are in the air. The shortfall highlights the need for continuing integration of our forces, an offensive/defensive approach to address the growing threat, and utilization of the full range, from strategic to tactical levels, of military options. In the near term, we will continue to address this mismatch through a comprehensive force management process. Over the longer term, we will continue to assess the evolving threat, analyze the offensive-

defensive mix, and look at procurement pathways to meet surging demand while emphasizing deterrence alternatives, to include diplomatic, information, and economic strategies.

Global Force Management:

The increasing demand of BMD assets is managed by the Joint Staff and the Services; JFCC IMD, serving as the Joint functional manager, evaluates and recommends sourcing of BMD requirements based on risk to the GCCs, the Services, and the global BMD construct. Due to the high demand, low-density nature of missile defense assets, all sourcing decisions have a direct and significant impact to other combatant commanders' contingency plans. The Global Force Management process enables senior leaders to make more informed BMD sourcing decisions based on global risk.

Multi-Regional BMD Asset Management:

While maintaining a holistic, multi-regional perspective, but with priority on defense of the homeland, JFCC IMD, in coordination with NORTHCOM, STRATCOM, and the GCCs, manages the availability of missile defense assets to balance operational readiness conditions, scheduled and unscheduled maintenance activities, and MDA and Services' test requirements. This important process allows us to assess, at all times, our readiness to defend against a ballistic missile attack.

> "The United States will seek to lead expanded international efforts for missile defense."—Ballistic Missile Defense Review Report, February 2010

Training, Exercises, and Wargames:

JFCC IMD continues to focus on the integration of allies into regional missile defense architectures; we leverage training, exercises, and wargames to increase dialogue and partnership. We are underway with Nimble Titan 14, our biannual multinational BMD wargame. While budget constraints have caused us to reduce the scale for regional exercise from interactive wargames to table-top exercises, we are still able to accomplish many of the same objectives. For the first time, Nimble Titan 14 will include the participation of the Kingdom of Saudi Arabia, the United Arab Emirates, and Turkey. In addition to NATO, we anticipate over 20 participating nations and a large number of international observers. Our campaign goals for this iteration of Nimble Titan will advance national policy objectives by helping mature NATO's new missile defense mission area, strengthen Japanese, South Korean, and Australian engagement, and openly work coalition BMD issues with Middle East nations. We will specifically focus on sensor integration, offense/defense force integration, and multinational BMD planning solutions. The Nimble Titan wargame is an invaluable BMD engagement tool to advance U.S. missile defense policy. The wargame allows us to mature cooperative relationships with our allies as well as advance our Nation's and combatant command's regional security objectives. This event is critical to developing our combined BMD architectures. Conclusions derived from training, exercises, and wargames will continue to shape our recommendations on asset allocation, resources, and operational planning through the existing DOD and missile defense community management structures.

Joint BMD Training:

During this past year, DOD designated STRATCOM as the lead for integrating and synchronizing joint BMD training. The designation mandated the transfer of missile defense training resources and responsibilities from MDA to STRATCOM by the conclusion of this fiscal year. On behalf of STRATCOM, JFCC IMD will execute this new responsibility. In preparation, JFCC IMD recently completed a Training Needs Assessment to define joint missile defense gaps and to identify corrective courses of action. The assessment findings and recommendations are currently being coordinated with the BMD community to include the Joint Staff, GCCs, and the Services. In the near future, we will implement a Joint BMD training curriculum. At the tactical level, the curriculum will focus on those skills and tasks required of the joint capability provider—the operator. Comprehensive training will also be provided to planners and senior leaders in joint BMD positions.

Warfighter Acceptance and Integrated Master Test Plan:

As the missile defense architectures mature, operators call for a credible, comprehensive assessment of new capabilities to inform warfighter operational acceptance. The MDA, in coordination with the Office of the Director, Operational Test and Evaluation, executes a robust, developmental and operational Integrated Master Test Plan. A rigorous test program builds the confidence of stakeholders and strengthens deterrence. As part of the Warfighters' Operational Readiness and Ac-

ceptance process, JFCC IMD works closely with MDA and the GCCs to ensure our warfighters take full advantage of these tests to better understand the capabilities and limitations of the emerging systems, rapidly integrate new capabilities into the operational architecture, and provide improvement recommendations and new capability requirements back to the developer.

In summary, JFCC IMD serves an integrating role for missile defense across multiple regions as we operationalize new capabilities, evolve command relationships, and reinforce our missile defense partnerships with allies. In view of worldwide events and current fiscal challenges, JFCC IMD remains focused on our key mission task to collaborate with the GCCs and MDA to posture our forces to meet the ballistic missile threat. Our missile defense capability continues to strengthen as warfighters gain increased competence and confidence in the BMD System. While work remains to be done, we have made significant progress in evolving the global missile defense capabilities, thereby strengthening the defense of the homeland and advancing our partnerships with allies in this pressing endeavor.

ARMY CONTRIBUTIONS TO THE NATION'S MISSILE DEFENSE CAPABILITIES

In addition to the MDA's materiel development efforts, the Army continues to develop and field systems that are integral contributors to our Nation's air and missile defense capabilities. A summary follows of the Army's major air and missile defense systems, aligned within the assistant Secretary of the Army for Acquisition, Logistics, and Technology organizational structure.

Army Integrated Air and Missile Defense (AIAMD):

Within the air and missile defense arena (AMD), the AIAMD program is the Army's highest priority effort. The program will field a common mission command system to all echelons of Army AMD forces to defend against rockets, artillery, and mortars; cruise missiles; manned and unmanned aircraft; air-to-ground missiles; and tactical ballistic missiles. The AIAMD capability integrates Army AMD sensors and shooters on a high-band width, low-latency, warfighter information network to provide the means to protect larger geographical areas. Fully implemented, AIAMD will also result in increased integrated fire control and reduced the risk of fratricide.

Medium Extended Air Defense System (MEADS):

As Congress is aware, the DOD decided to complete only the design and development phase of the MEADS program. Fiscal year 2013 was the final year for which the Army sought MEADS funding. The Army will continue to support data archival and evaluate opportunities to harvest technology from our MEADS investments.

Patriot/Patriot Advanced Capability-3 (PAC–3):

Patriot/PAC–3 is the Army's premier weapon system against air, cruise missile, and tactical ballistic missile threats. With the DOD decision to end U.S. participation in the MEADS program at completion of the design and development phase, the Army is investing in improvements to the Patriot system to support the AMD strategy, increase reliability, drive down operational and sustainment costs, and remain viable well into the future. Also, the Army continues to improve Patriot's capability to counter the evolving tactical ballistic missile, cruise missile, and air threats. The Army is integrating Patriot and other air defense capabilities into the AIAMD architecture. PAC–3 interceptors continue to expand the battlespace allowing operational flexibility to our Army, GCCs, and international partners. The next generation PAC–3 missile, the Missile Segment Enhancement, is on track for a 2015 delivery to the force.

Indirect Fire Protection Capability (IFPC) Increment 2 Intercept:

This program will provide an additional layer of short range air defense capability to address the threat from unmanned aerial systems, cruise missiles, rockets, artillery, and mortars. The IFPC, using existing radar assets, will be integrated with the AIAMD capability to provide 360 degree, multiple azimuth protection to deployed forces supporting stability and counterinsurgency operations.

Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS):

The JLENS system provides long-range, persistent, and elevated surveillance, detection, classification, identification, and fire control quality tracking for airborne objects such as cruise missiles, manned and unmanned aircraft, and large caliber rockets. The system has also shown the capability to track surface moving targets. In accordance with direction from OSD and the Joint Staff, the Army is completing development and testing of the JLENS capability and will soon begin support of a 3-year operational exercise within the NORTHCOM area of operations.

Terminal High Attitude Area Defense System:

Developed by the MDA, THAAD is a long-range, land-based, theater defense weapon designed to intercept threat missiles during late mid-course or final stage flight. THAAD capability for our GCCs recently became available as the MDA-designed system transfers capability to the Army. Just last month, THAAD Batteries 1 and 2 were granted conditional materiel release. Each of the batteries, consisting of 95 soldiers, an AN/TPY–2 FBM radar, a fire control and communications element, a battery support center, and an interim contractor support element, has completed equipment and unit collective training. The two batteries currently have three THAAD launching systems each but will soon have their full complement of six systems. Equipment fielding is also underway for THAAD Battery 3 and production has begun on Battery 4 equipment. THAAD is a high demand, low density asset as demonstrated by the recent deployment of a battery to Guam. The addition of THAAD capabilities to the Army's air and missile defense portfolio brings an unprecedented level of protection against missile attacks to deployed U.S. forces, friends, and allies.

CONCLUSION

Mr. Chairman and Ranking Member Sessions, as a member of the joint missile defense community, the Army will continue to pursue operational, capability, and materiel enhancements to the Nation's BMDS. As a Service, the Army has lead responsibility for GMD, AN/TPY–2 FBM, Patriot, and THAAD. Our trained and ready soldiers operating the GMD elements in Colorado, Alaska, and California remain on point to defend the Homeland against a limited intercontinental ballistic missile attack. As a force provider to the GCCs, our soldiers ensure essential regional sensor capabilities and ballistic missile early warning. STRATCOM, through the JFCC IMD, will continue to integrate BMDS capabilities to counter global asymmetric threats and protect our Nation, deployed forces, friends, and allies.

While the operational, doctrine, and materiel development enhancements of the BMDS are essential, our most essential assets are the soldiers, sailors, airmen, marines, and civilians who develop, deploy, and operate our missile defense system. The fiscal year 2014 budget proposal supports these essential personnel by advancing the modernization and improvements of the Army's missile defense systems to support the Nation's global BMDS. I appreciate having the opportunity to address missile defense matters and look forward to addressing any of your questions. Secure the High Ground and Army Strong!

Senator UDALL. Thank you. Thank you, General.

Admiral Syring.

STATEMENT OF VADM JAMES D. SYRING, USN, DIRECTOR, MISSILE DEFENSE AGENCY, DEPARTMENT OF DEFENSE

Admiral SYRING. Good afternoon. Chairman Udall, Senator Fischer, distinguished members of the subcommittee: I appreciate the opportunity to testify before the subcommittee for the first time as the Director of the MDA.

My priorities are to continue strong support of the warfighter, support what we have deployed, and deliver more capability to the combatant commanders. We are taking several steps over the next few years to implement Secretary Hagel's March 15 guidance to strengthen our Homeland defenses. First among those steps is returning the redesigned GBI to flight testing later this year. The successful controlled test flight of the GBI earlier this year gives us confidence that we have addressed the causes of the end game failure in the December 2010 test. Later this month we will demonstrate the improvements made to the GBI fleet in an intercept test of the first generation operational exoatmospheric kill vehicle, the first such test since December 2008.

We are increasing the operational fleet of GBIs from 30 to 44 by 2017. This will involve the reallocation of GBIs and the refurbishment and reactivation of Missile Field 1 in Alaska. We have al-

ready begun to evaluate locations in the continental United States to determine a site suitable for possible future deployment of Homeland defense interceptors. Also, in order to provide more robust sensor coverage for our Homeland defense, this year we are working with our Japanese partners to deploy a second TPY–2 radar to Japan.

We will continue to strengthen our regional defenses with funding to operate and sustain, command, control, battle management, and communications, and TPY–2 radars at fielded sites, and we will deliver more interceptors for THAAD, Aegis BMD, and others. MDA will continue to fund upgrades to the phase 1 of the EPAA and proceed on our schedule to complete the Aegis Ashore sites in Romania by 2015 and Poland by 2018.

Mr. Chairman, when I arrived at the MDA last November, I was impressed with the organization and professionalism of the workforce. They are highly motivated, they're the best at what they do. It's an honor to serve with them every day.

I ask that my written statement be accepted for the record.

Senator UDALL. Without objection.

Admiral SYRING. I look forward to answering your questions, sir.

[The prepared statement of Admiral Syring follows:]

PREPARED STATEMENT BY VADM JAMES D. SYRING, USN

Good afternoon, Chairman Udall, Ranking Member Sessions, distinguished members of the subcommittee. I appreciate this opportunity to testify before you for the first time as the Director of the Missile Defense Agency (MDA). Our current budget request of $7.684 billion for fiscal year 2014 will continue the development of defenses for our Nation, deployed forces, allies, and international partners against increasingly capable ballistic missiles. Since the previous Director testified before you last year, we have made good progress in the development and deployment of the Ballistic Missile Defense System (BMDS) and we continue to build capabilities to defeat more complex threats. My priorities in fiscal year 2014 are to continue our strong support of the warfighter, fix what needs to be fixed, support what we have deployed, and deliver more capability to the combatant commanders (COCOMs).

BALLISTIC MISSILE THREAT

The threat continues to grow as our potential adversaries are acquiring a greater number of ballistic missiles, increasing their range and making them more complex, survivable, reliable, and accurate. The missile defense mission is becoming more challenging as potential adversaries incorporate BMD countermeasures. Space-launch activities in Iran and North Korea involve multistage systems that serve to further the development of ballistic missile technology for longer-range systems including intercontinental ballistic missile (ICBM) technologies and systems. As the Director for National Intelligence recently stated, "Iran has demonstrated an ability to launch small satellites, and we grow increasingly concerned that these technical steps . . . provide Tehran with the means and motivation to develop larger space-launch vehicles and longer-range missiles, including an ICBM." In addition to the Taepo Dong 2 SLV/ICBM, North Korea is developing a road-mobile ICBM and an intermediate-range ballistic missile (IRBM) capable of reaching Guam, the Aleutian Islands, and potentially Hawaii. Iran also has steadily increased its ballistic missile force, deploying next generation short- and medium-range ballistic missiles (SRBMs and MRBMs) with increasing accuracy and new submunition payloads. Iran has publicly demonstrated the ability to launch simultaneous salvos of multiple rockets and missiles and openly discussed tests of an anti-ship ballistic missile.

SUPPORT FOR THE WARFIGHTER

Our overriding goal is to provide support to the warfighter. To this end we will increase system reliability, focusing especially on improving the performance of the Ground Based Interceptors (GBIs) and the Aegis Weapons System, including the Standard Missile (SM–3) interceptors and continuing our support for operational systems like the AN/TPY–2 radar and the Command, Control, Battle Management

and Communications (C2BMC) at fielded sites. We will also deliver more interceptors for Terminal High Altitude Area Defense (THAAD), Aegis Ballistic Missile Defense (BMD), and, pending a successful return to intercept, Ground-based Midcourse Defense (GMD) as we look for ways to make it more operationally effective and cost-effective.

We remain committed to conducting developmental and operationally realistic tests and use a "fly-before-you-buy" approach. MDA continues to work closely with the Director, Operational Test & Evaluation (DOT&E) and collaboratively with independent testers and the Services. We follow an Integrated Master Test Plan (IMTP), a comprehensive, integrated, and cost-effective flight and ground test program that blends developmental testing with tests that employ operationally realistic conditions to demonstrate BMD capabilities against current and projected threats. I have reviewed the DOT&E 2012 Assessment of the BMDS, which identified areas that need improvement, specifically in the areas of BMDS system-level testing and the accreditation of BMDS element models. The report's findings acknowledged our integration accomplishments. We must still work to improve battle management for a fully integrated BMDS. We also agree that we need improved GMD performance models to fully characterize system performance. Similarly, although the report did note our progress in testing against targets with certain SRBM and MRBM characteristics, the acquisition of additional accredited target models will help evaluate the performance of all phases of regional defense, specifically for the European Phased Adaptive Approach (EPAA).

In order to provide the warfighters confidence in the execution of their integrated air and missile defense plans and the opportunity to refine operational doctrine and tactics, this year we plan to demonstrate the ability of the integrated BMDS to defeat up to three near-simultaneous air and ballistic threats. In the integrated BMDS flight test (FTI–01) this past October, the largest, most complex ballistic missile defense test ever attempted, we demonstrated the capability of the BMDS to engage upon a raid of five near-simultaneous representative threats, air-breathing and ballistic missiles, hitting four out of five targets. In this year's operational BMDS flight test we will use an operationally relevant scenario to demonstrate the integration of regional defense systems. In FTO–01 we will engage two medium-range ballistic missile targets launched within minutes of one another with Aegis BMD and THAAD using Forward Based Mode (FBM) AN/TPY–2 radar and the C2BMC system operated by soldiers, sailors, and airmen. In fiscal year 2014 President's Budget Submission (April 2013) we have added 12 more flight tests to the IMTP, going from 37 tests in IMTP version 12.2 to 49 tests in IMTP version 13.1. As the BMDS matures we need to increase complexity in our flight tests by doing the following: adding system-level operational tests; increasing the number of BMDS assets in those tests; increasing the numbers, types (ballistic and air-breathing) and ranges of the threat representative targets we use and conducting more simultaneous launches; and adding the entire warfighting chain of command to evaluate concepts of operation and tactics, techniques and procedures. We have also increased the number of ground-tests in those planning periods from 88 to 106.

HOMELAND DEFENSE

MDA's highest near-term priority remains the successful GMD intercept flight test of the newest GBI Exo-atmospheric Kill Vehicle (EKV)—the Capability Enhancement (CE)-II EKV. The successful non-intercept controlled flight test of the CE–II GBI earlier this year (CTV–01) gives us confidence and cautious optimism we have addressed the causes of the FTG–06a endgame failure in December 2010 and are on the right track for a successful return to intercept using the redesigned EKV. Based on our analysis of the data from CTV–01, we currently plan to conduct FTG–06b in early fiscal year 2014 to demonstrate the ability of the CE II EKV to discriminate and intercept a lethal object from a representative ICBM target scene. We plan to conduct another intercept test using a two- or three-stage GBI and the CE II EKV by the end of fiscal year 2014 (FTG–09).

With DOT&E concurrence, we plan to accelerate the next intercept test of the CE–I EKV (FTG–07) to take place this May or June in order to increase warfighter confidence and maintain a testing cadence. We have made numerous improvements to the CE–I fleet through refurbishments since the last successful CE–I flight test in 2008, and this test will demonstrate the reliability of those refurbished GBIs. I am committed to flight testing the GMD system, at a minimum, once per year; however, I can assure the committee that I will not approve the execution of a flight test unless I believe we are ready. We will work closely with DOT&E to develop scenarios and targets for all of our tests.

We share the Government Accountability Office concern about concurrency in the GMD program and have restructured our GMD return to intercept (RTI) plan and schedule to design and qualify EKV fixes that address root cause of the FTG–06a failure, and confirm the fixes through rigorous ground and flight testing. The original RTI plan accepted significant and excessive concurrency (parallel development, testing and production activities) and the result has been continued slips in the RTI plan. The current baseline RTI plan reduces this concurrency using systems engineering "gated" events that confirm critical components are ready to proceed to testing and production while leaving options open to integrate lower risk components.

Today, 30 operational GBIs protect the United States against a limited ICBM attack from current regional threats, such as North Korea and Iran. Over the past year we have achieved higher operational availability rates with the GMD system, mainly through high levels of redundancy in the GMD Fire Control and communications systems. The currently operational hardened Fort Greely, AK, (FGA) power plant distributes commercial power and provides generator power during outages. We continued to maintain and improve the GMD guidance system and engagement performance through software upgrades of the CE–I and CE–II EKVs. Last year we completed construction of the 14-silo Missile Field-2 at FGA and emplaced the first GBI in that field in March 2012. We also relocated the last interceptors from Missile Field-1. This year we will continue with our Enhanced Reliability and Stockpile Reliability Programs to track performance, aging, and reliability metrics, software updates, and technology enhancements for all GMD ground systems.

MDA requests $1,033.9 million in fiscal year 2014 in Research, Development, Test, and Evaluation (RDT&E) funding for GMD to sustain the current system and take steps to address the continued development of ICBMs by countries such as North Korea. In addition to our flight testing activities, we will continue our GMD reliability activities and fleet upgrade program. We are also increasing the number of GBIs we plan to produce and deploy. As announced on March 15 by Secretary Hagel, consistent with the February 2010 Ballistic Missile Defense Review (BMDR), and assuming a successful return to intercept, we plan to increase our operational GBI fleet from 30 to 44 in 2017 by re-allocating GBIs from the spares and stockpile reliability program. We will reset this program with the procurement of 14 additional GBIs, 2 per year, starting in fiscal year 2016. We also request $135 million in fiscal year 2014 to rebuild a hardened Missile Field 1 critical to achieving the 44-operational-GBI capability.

In fiscal year 2014 we will continue work on the GBI In-Flight Interceptor Communication System (IFCS) Data Terminal (IDT) at Fort Drum, NY, which we will deliver in early fiscal year 2015 and is planned to be operational in 2015. The East Coast IDT will enable communication with GBIs launched from Fort Greely, AK, and Vandenberg Air Force Base in California over longer distances and improve defenses for the eastern United States by increasing system performance in specific engagement scenarios.

Pursuant to the National Defense Authorization Act for Fiscal Year 2013, this year we will begin a siting study for a potential Missile Field in the continental United States (CONUS). MDA has initiated a CONUS Interceptor Site (CIS) study to evaluate several sites for the potential future deployment of additional GBIs capable of protecting the homeland against threats from nations such as North Korea and Iran. MDA will conduct a siting study this year to inform the President's Budget submission for fiscal year 2015. The Environmental Impact Statement will be completed by the first quarter of fiscal year 2016. These efforts would shorten the time to deploy additional GBIs if a future decision to do so were taken.

We are also improving our homeland defense options with the continued development of the two-stage GBI. The two-stage GBI has less burn time than the three-stage version, which allows it to operate within shorter engagement timelines, and will preserve future deployment options.

To maintain readiness in our network of strategic radars, last year MDA worked with the Air Force to begin upgrading the Early Warning Radar (EWR) at Clear, AK, to give it a missile defense capability, providing improved ballistic missile defense sensor coverage over the continental United States and reducing sustainment and operating costs. For fiscal year 2014 we are requesting $51 million to continue this work. Along with the Clear EWR contract award, we also exercised a contract option in fiscal year 2013 to upgrade the Cape Cod EWR. The upgraded Clear EWR will be added to the BMDS operational baseline in fiscal year 2017, with the upgraded Cape Cod EWR added in fiscal year 2018. MDA plans to transfer the Beale (California), Fylingdales (United Kingdom), and Thule (Greenland) Upgraded Early Warning Radars to the Air Force in the later part of fiscal year 2013 once all three radars are operating with the same software configuration.

This year we are also working with our Japanese partners to deploy a second AN/TPY–2 radar to the U.S. Pacific Command (PACOM) Area of Responsibility to enhance regional defenses and provide more robust sensor coverage for homeland defense.

We are requesting $44.5 million in fiscal year 2014 for continued Sea Based X-band (SBX) radar operations. For affordability reasons, MDA transferred the SBX to Limited Test Support Status, where the radar continues to support the BMDS test program and remains available for contingency deployment under the operational command of PACOM. We completed the transfer of the SBX vessel to the U.S. Navy Military Sealift Command in fiscal year 2012. New SBX operational software with improved discrimination and debris mitigation was delivered and completed in January 2013. The new SBX configuration will complete integration fielding and testing with GMD in the third quarter of fiscal year 2014.

REGIONAL DEFENSES

Deployment of regional defenses to protect our deployed forces, allies and international partners remains one of our top priorities. Our fiscal year 2014 budget request funds the continued development and deployment of defenses against SRBMs, MRBMs, and IRBMs in support of combatant commanders' near-term and future priorities.

Terminal High Altitude Area Defense

MDA delivered the 50th THAAD interceptor last year, completing the initial interceptor load for the two fielded batteries. With the conclusion of unit collective training, MDA also completed fielding of the second THAAD battery. The U.S. Army's granting of Conditional Materiel Release for the THAAD weapon system made THAAD available for worldwide operational employment. In recent tests we demonstrated THAAD's ability to intercept an MRBM as part of an integrated operational test with PAC–3 and Aegis BMD (FTI–01) and its ability to detect, track, and engage multiple simultaneous targets (FTT–12).

In fiscal year 2013 we are delivering the third THAAD battery to the U.S. Army and initiating soldier new equipment training, which will be completed in fiscal year 2014. MDA will continue to deliver THAAD interceptors to inventory, achieving 82 interceptors by the end of this fiscal year and 98 interceptors by the end of fiscal year 2014. For fiscal year 2014, MDA is requesting $581 million for THAAD procurement, which includes the purchase of 36 THAAD interceptors and 6 launchers, and 2 THAAD Tactical Station Groups for the sixth THAAD Battery. In fiscal year 2014 we expect to deliver the fourth THAAD Battery. Our current plans are to deliver six batteries and, based on combatant commanders' desires, we are working with the Army to analyze a requirement for a seventh THAAD Battery within the Future Years Defense Program. We also are requesting $269 million in RDT&E funding in fiscal year 2014 and $92 million for THAAD operations and maintenance. We will continue to enhance THAAD's ability to operate through post-intercept debris, enable launch of THAAD's interceptors using sensor data provided by other BMDS sensors, and maintain capability against current and evolving threats.

Aegis Ballistic Missile Defense

Last year we installed the Aegis BMD 3.6 weapon system on 3 Aegis ships, for a total of 24 Aegis BMD 3.6 ships, and completed 2 Aegis BMD 4.0 installations. We also commenced two more Aegis BMD 4.0 installs and initiated BMD 5.0 install on the Aegis BMD test ship, the USS *John Paul Jones*, which will replace USS *Lake Erie* in that role. This approach supports Navy and MDA testing of the Integrated Air and Missile Defense combat system. We now have a total of 27 certified Aegis BMD ships. This past year we delivered 11 SM–3 Block IAs and 2 SM–3 Block IBs, both of which were expended in tests. By the end of 2014, up to 39 SM–3 Block IBs will be delivered. With the Japan Ministry of Defense, we continued SM–3 Block IIA system and component Preliminary Design Reviews and awarded a contract to complete SM–3 IIA development.

In May 2012, we conducted a lethal engagement resulting in the successful intercept of a unitary separating target with the second-generation Aegis BMD 4.0 combat weapon system onboard the USS *Lake Erie* and an SM–3 IB guided missile (FTM–16 Event 2a). This test also validated the resolution of the previous flight test issue. In June 2012, we demonstrated again the ability of the SM–3 IB and the Aegis BMD 4.0 combat system to intercept of a separating ballistic missile target (FTM–18). Both intercept tests represented significant accomplishments for the next generation Aegis Weapon System and SM–3 for regional defense and specifically in support of EPAA Phase II. In the integrated FTI–01 BMDS flight test this past October, the USS *Fitzgerald* successfully engaged a low flying cruise missile over

water. The Aegis combat system also tracked an SRBM and launched an SM–3 IA against that threat space. Despite indication of a nominal flight of the SM–3 IA, we did not achieve an intercept. We have a Failure Review Board currently investigating why this occurred. We have combed through ground test data from all fleet rounds and have not found any rounds with the same ground test results as the SM–3 IA used in FTI–01, which gives us confidence in all deployed SM–3 IAs. This past February, in FTM–20, we successfully intercepted a unitary MRBM target using the SM–3 IA and the Aegis BMD 4.0 weapon system in a remote engagement using data from the Space Tracking and Surveillance System demonstration (STSS–D) satellites. We passed very high quality fire control quality data provided from STSS–D satellites through C2BMC. This was a highly complex test, and it proved the value of an integrated C2 and sensor network and the use of space-based sensors.

This year and next will be busy years for Aegis BMD flight testing as we continue to demonstrate capability of the Aegis BMD 4.0 Weapons System with the Standard Missile Block IB in a series of intercept flight tests—FTM–19, FTM–21 and FTM–22. We have postponed FTM–19 to improve manufacturing processes and procedures due to previous subcomponent reliability issues. We are now confident we understand these issues to continue with the test program and initial production decisions. FTM–19 is an important step for an All Up Round production decision of the SM–3 IB. Later this fall, in FTM–21, an Aegis BMD ship will demonstrate a salvo fire capability. FTM–22 will demonstrate the IOT&E of the SM–3 IB against a complex MRBM target. These two tests will support a full-rate production decision. Tests of the SM–3 IB against various targets from both ships and our first flight testing from Aegis Ashore continue in fiscal year 2014.

In response to the combatant commanders' demand signal for more BMD ships with the latest tested capability, Navy and MDA are jointly executing efforts to upgrade Aegis Destroyers with BMD capability, incorporating Aegis BMD into the Navy's Aegis DDG Modernization Program and new construction of Aegis BMD DDGs. In 2014, two previously installed Aegis BMD ships will be upgraded with the 4.0 weapons system configuration. In addition to the ship upgrades, one non-BMD capable ship is programmed to start the Aegis Modernization Program. Construction of DDG 113, the first Aegis Destroyer built from the keel up with the BMD capability, is well underway. Ships identified for homeport transfer to Rota, Spain, will have been upgraded or programmed to receive the BMD installation.

We also continue development of a Sea-Based Terminal capability to provide protection of maritime forces against advanced anti-ship ballistic missiles and increased layered defense for forces ashore. Using an incremental development approach, we are incorporating BMD capability into the Navy's SM–6 guided missile and the BMD 5.0 weapon system. We expect to test and certify the first increment of Sea-Based Terminal capability in 2015 and 2016.

We are requesting $937 million in RDT&E funding in fiscal year 2014 to continue the development, testing and, installation of Aegis BMD capabilities to defeat longer range and more sophisticated ballistic missiles launched in larger raid sizes. We also request $581 million in fiscal year 2014 for the procurement of 52 SM–3 IB guided missiles and $18 million for operations and maintenance of SM–3 IAs. By the end of fiscal year 2014, we plan to deliver a total of 180 SM–3s, including IA and IB variants.

European Phased Adaptive Approach

We will continue to support the EPAA to provide coverage of European NATO territory from Iranian ballistic missile threats. In 2011 MDA completed Phase 1 of the EPAA to provide coverage of NATO territory in Europe with the deployment of Aegis BMD 3.6 ships with SM–3 IAs and a SPY–1 radar in the Mediterranean, the AN/TPY–2 radar (FBM) to U.S. European Command (EUCOM) in Turkey, and the C2BMC Spiral 6.4 system at Ramstein AFB in Germany. We will continue to invest resources for EPAA development, testing, and deployment.

Our goal in EPAA Phase 2 is to provide a robust capability against SRBMs and MRBMs by ensuring the system provides multiple opportunities to engage each threat missile in flight. The architecture includes the deployment of the Aegis BMD 4.0 and 5.0 weapon systems with SM–3 IBs at sea and at an Aegis Ashore site in Romania. In fiscal year 2012 MDA conducted Romania Aegis Ashore planning and environmental studies and began component production necessary for early integration and testing of the Aegis Ashore system by 2015. Aegis Ashore began construction activities in 2012 in Moorestown, New Jersey and construction of a test site in Kauai, Hawaii. We signed an overarching Memorandum of Agreement with the U.S. Navy regarding Operations and Sustainment of the European Aegis Ashore sites. The Aegis Ashore Missile Defense Test Complex at the Pacific Missile Range

Facility (PMRF) will support flight testing of Aegis Ashore capabilities in an operational configuration. The complex will be available to conduct the first Aegis Ashore test firing in fiscal year 2014. MDA will initiate construction of the Aegis Ashore site in Deveselu, Romania with the delivery of the deckhouse in fiscal year 2014. The site will be operational by December 2015. MDA requests $85 million in fiscal year 2014 to continue construction of the Aegis Ashore site in Romania.

In support of EPAA Phase 3, the SM–3 Block IIA, which we are co-developing with the Japanese Government and an upgraded version of the Aegis Weapons System are on schedule to be available for deployment in 2018 at Aegis Ashore sites in Romania and Poland and at sea. Deployment of Phase 3 will enhance and expand protection for European NATO countries and U.S. forces through the region from MRBMs and IRBMs from the Middle East. The upgraded Aegis Weapons System combined with the faster, longer reaching SM–3 IIA will provide capability to counter more sophisticated threats when compared to the SM–3 IA and IB and will extend coverage to NATO allies in Europe threatened by longer range ballistic missiles. With the completion of Phase 3, EPAA will provide upper-tier coverage of NATO Europe. As we work closely with Navy in modernization, we will also install the 5.1 Aegis Weapons System on ships for deployment worldwide in support of the Combatant Commanders. We will also install and deploy the 5.1 system in the two Aegis Ashore batteries. This past year we continued development of the Aegis BMD 5.1 fire control system and awarded the SM–3 IIA contract to complete missile development. In fiscal year 2014 we will conduct the first fly-out test of the SM–3 IIA propulsion stack to measure its performance. MDA requests $308.5 million in RDT&E funding in fiscal year 2014 to continue the bilateral, cooperative effort.

Command, Control, Battle Management, and Communications and Sensors

We successfully demonstrated this past year our ability to interoperate between NATO's Active Layered Theater Ballistic Missile Defense system and C2BMC. The NATO BMD Operations Center (BMDOC) at Ramstein Air Base is NATO's 24/7 command and control center for missile defense. Today, the NATO BMDOC participates in joint exercises with the EUCOM missile and air defense architecture and is responsible for command and control of the multi-national Patriot units currently deployed in Turkey.

In 2012 we continued to support warfighter operations of the EUCOM BMDS capability for regional defense and executed key warfighter events to demonstrate readiness for defense of Israel by linking the AN/TPY–2 and C2BMC ballistic missile threat tracks to Aegis BMD, THAAD, and Patriot shooters in a distributed environment using operational communications and crews. In partnership with the Combatant Commands, we maintain the capability to engage multiple simultaneous threat attacks in the region. Last year we completed the AN/TPY–2 radar deployment to U.S. Central Command (CENTCOM), where we deployed a C2BMC suite ahead of schedule as well as the Global Engagement Manager (GEM) for control of the AN/TPY–2 radar to enhance regional missile defense.

We request $300 million in fiscal year 2014 to develop and deploy BMDS sensors, and $145.8 million to operate and sustain the nine AN/TPY–2 radars and support the UEWRs and Cobra Dane EWR.

We request $418.4 million in fiscal year 2014 to operate and sustain C2BMC at fielded sites and continue C2BMC program spiral development of software and engineering to incorporate enhanced C2BMC capability into the battle management architecture and promote further interoperability among the BMDS elements, incorporate boost phase tracking, and improve system-level correlation and tracking. We will also continue communications support for the AN/TPY–2 radars and C2BMC upgrades.

We request $44.9 million for continued operation of the Space Tracking and Surveillance System in fiscal year 2014. In fiscal year 2012, MDA operated STSS demonstration satellites (STSS–D) around the clock with availability exceeding 95 percent as well as the Near Field Infrared Experiment satellite to collect Earth limb phenomenology. We continue to operate the two STSS–D satellites to conduct cooperative tests with other BMDS elements and demonstrate the capability of the satellites against targets of opportunity to provide high precision, real-time tracking of missiles and midcourse objects that enable closing the fire control loops with BMDS interceptors. We conducted a successful intercept of a threat MRBM last February by Aegis BMD system using only STSS–D data to provide launch data for the SM–3 IA guided missile (FTM–20).

The Department of Defense has terminated the Precision Tracking Space System (PTSS). Concurrency in the development schedule and uncertainty in the cost estimates put in doubt long-term fiscal sustainability. Moreover, the PTSS acquisition strategy was high risk. We believe we need to be in space for infrared (IR) discrimi-

nation capability, but for now we can address the threat with other land-based sensors in key locations, which will allow us to provide support to the warfighter in the near term and assume less acquisition risk. A study has been initiated to determine how best to support future sensor requirements and we are exploring technologies to improve the capabilities of ground, air, and space sensors.

DEVELOPING NEW CAPABILITIES

We are developing fiscally sustainable advanced BMD technologies that can be integrated into the BMDS to adapt as threats change. Our investments are focused on technology that brings upgradeable capability to the warfighter. For sensors, in the near-term we will integrate and demonstrate electro-optical and infrared sensors using available airborne UAV platforms to create a precision track our shooters can use. . . For interceptors, our overall strategy includes making near-term investments in interceptor technology that accelerate our ability to use a kill vehicle singularly or in combination in a way that balances our overall approach to solving the very difficult problems of lethal object discrimination, limited inventory and cost per kill. We will also explore other ways to improve the exchange ratio in the missile defense battle.

Last year, we restructured our high power directed energy program and began building the foundation for the next-generation laser system by competing two promising lightweight, highly efficient solid state lasers, one at Lawrence Livermore National Laboratory and the other at MIT Lincoln Laboratory. At MIT Lincoln Laboratory, we built a small-scale prototype of a laser device that exploits a novel technique for combining the output of individual fiber lasers. This year, for the fiber laser, we will team with the Defense Advanced Research Projects Agency to determine the most efficient method of combining laser beams. We will improve the performance of the competing Diode Pumped Alkali Laser System at Lawrence Livermore National Laboratory through a series of laser system upgrades. MDA is requesting $43.5 million in fiscal year 2014 to demonstrate the efficiency, producibility, and scaling potential of the two candidate lasers.

MDA requests $77.3 million in fiscal year 2014 to evaluate and research component and sensor technology requirements. Incorporating promising hardware and software from prior programs into our advanced sensor test bed, we will prove the value of emerging discrimination concepts.

Despite the commonality of their mission and functions, components on the current midcourse phase interceptors, the GBI and SM–3 kill vehicles, were developed independently at a substantial cost over the past decade. We are looking at the benefits of developing common kill vehicle technology for the GBI and SM–3 variants, focusing in particular on the ability to address future technology advancements through the development of a similar set of components, subsystems, and software. This common kill vehicle technology effort initially will perform risk reduction and examine other technologies that may improve future interceptor capabilities. This effort is in keeping with the plan for the next generation exo-atmospheric kill vehicle, as directed by section 225 of the National Defense Authorization Act for Fiscal Year 2013.

Given changes in the assessment of the threat from North Korea to the U.S. Homeland, as well as delays in the potential deployment of any SM–3 IIB interceptor resulting from delayed technology development due to budget reductions, the Department is evaluating alternatives to hedge against future threat technology advancements. The Department is no longer planning for the SM–3 IIB program and does not request funding for the program in fiscal year 2014. In addition to the cuts imposed in the fiscal year 2012 Appropriation and fiscal year 2013 funding, analyses show a larger missile would be required to achieve the necessary burn out velocity, and a larger missile design would have taken additional time and resources, pushing the initial operational capability out past 2022. Our near- to mid-term focus for homeland defense will be to increase GMD capability, to include increasing deployed GBIs from 30 to 44, investing in Common Kill Vehicle technology, and conducting siting and EIS studies for a new U.S. GBI missile field.

MDA requests $19.2 million in fiscal year 2014 to continue partnerships with industry and universities to seek innovative concepts in sensors, weapons, and advanced algorithms. We will leverage University-to-University International Research opportunities with allied nations to enhance Advanced Technology initiatives and build stronger relationships with our international partners and NATO allies.

INTERNATIONAL COOPERATION

MDA is engaged either bilaterally or multilaterally with nearly two dozen countries and international organizations, such as NATO and the Gulf Cooperation Council.

In Asia-Pacific, the United States and Japan are working together to support the deployment of the second U.S. forward-based AN/TPY–2 radar. In addition, we continue to develop collaboratively the SM–3 IIA to enable U.S. and Japanese Aegis BMD ships to engage MRBMs and IRBMs and, when coupled with the upgraded Aegis BMD weapon system, more sophisticated ballistic missile threats. This year we signed a Second Amendment to the formal joint agreement with Japan administering the SM–3 Block IIA Cooperative Development (SCD) effort. The amendment will reduce risk in the SCD program by adding flight tests and sufficient time in the schedule for additional engineering analysis between flight tests.

This budget continues MDA's longstanding commitment in support of Israeli defensive efforts. MDA is working with the Israel Missile Defense Organization (IMDO) to deliver Iron Dome batteries and interceptors. Iron Dome has had significant success protecting the Israeli population against short-range rockets and large artillery shells. MDA has been working closely with U.S. Department of Defense leadership to ensure U.S. funding for Iron Dome is being used effectively to produce additional Iron Dome batteries and interceptors. Any further U.S. contributions on Iron Dome will be governed by a formal international agreement. MDA is actively seeking Iron Dome co-production opportunities for U.S. defense industry. We are negotiating to obtain available technical data packages and data rights should there be a future U.S. defense requirement for this weapon system.

We are also developing missile defense systems with Israel to address regional ballistic missile threats. The David's Sling Weapon System is designed to defeat SRBM threats. IMDO and MDA completed the first phase of the development of David's Sling last November with a successful intercept test. MDA and Israel also are co-developing the Arrow-3 Upper Tier interceptor. The advanced design of this interceptor was successfully tested this past February in a non-intercept test; a second fly-out test is scheduled for fiscal year 2014. MDA also participated in Austere Challenge 2012 exercises, which successfully demonstrated the concept of operations for the U.S.-Israel BMD architecture and future interoperability.

Elsewhere in the Middle East, U.S. BMD capabilities continue to expand in defense of forward-deployed U.S. armed forces, allies, and partners. Major MDA activities in the Middle East involve relationships with regional partners expressing interest in procuring U.S. systems. Last year, MDA was officially designated as a Foreign Military Sales (FMS) Implementing Agency for THAAD and the AN/TPY–2 radar. In addition to our current $3.5 billion FMS case with the United Arab Emirates, we are engaged with several other potential FMS customers for these very capable systems.

In Europe, aside from EPAA planning and fielding, MDA maintains active bilateral relationships with our close allies in that region.

CONCLUSION

Mr. Chairman, when I arrived at the Missile Defense Agency last November, I was impressed with the organization and the dedication and professionalism of the government and contractor workforce. The Agency is settling into the post-base realignment and closure configuration, which we completed in fiscal year 2011. This has been a challenging period for our personnel, but we have stayed focused on our core mission. I am proud to lead the people behind today's missile defense program. They are highly motivated and the very best in the world at what they do.

The impact of the sequestration on the program and workforce is significant. We will see limitations in our ability to deliver future homeland defense capabilities. To mitigate some of the effects of sequestration cuts, I will be working with the Department to submit an Above Threshold Reprogramming request as part of the Department's larger request this year.

Whatever happens, I am dedicated to executing successful GMD intercept flight tests over the coming year and will continue to strive to ensure reliability in our operational homeland defenses. We have made good progress in our work with our international partners, and I want to continue those important efforts. We will continue our work with the warfighter to develop, test, and field a networked, global BMD system that is flexible, survivable, and affordable. We will work on ways to cut sustainment costs, reduce high-risk acquisition concurrency, improve system reliability, and deliver capabilities as promised. Mindful that today's security environment is unlikely to mirror that of tomorrow, we will continue to invest in promising

and potentially game-changing technology programs to ensure the BMDS will be capable of defeating the complex threats we expect to face in the future.

I look forward to answering the subcommittee's questions. Thank you.

Senator UDALL. Thank you, Admiral.

Ms. Chaplain.

STATEMENT OF MS. CRISTINA T. CHAPLAIN, DIRECTOR, ACQUISITION AND SOURCING MANAGEMENT, GOVERNMENT ACCOUNTABILITY OFFICE

Ms. CHAPLAIN. Chairman Udall, Senator Fischer, and members of the subcommittee: Thank you for inviting me here today. I'd like to make a couple of brief points about MDA's acquisition progress.

In addition to the successful test events just mentioned, MDA has reduced acquisition risk in some key programs, such as the SM–3 2A interceptor, where MDA postponed the start of product development until it addressed several critical technical challenges. That's a good step because you're going to prevent problems that could cost a lot later on in a program.

MDA has also taken important steps to clarify the baselines it reports to Congress, for example by defining more clearly what costs are presented and what costs are not being presented and why. But more needs to be done to put acquisitions on a sounder footing and to help Congress prioritize limited resources.

For example, at this time costs for programs still cannot be compared over time. Some programs are still following high-risk strategies. For example, MDA is using new targets for the first time in major operational tests, rather than demonstrating them in a less complex and expensive scenario.

Moreover, as we pointed out in our report, in light of budget constraints we believe MDA should more rigorously analyze alternatives before committing to new investments. We reported that two programs recently proposed for cancellation did not have robust analyses of alternatives.

Finally, I'd just like to recognize Admiral Syring's commitment to improving acquisition and reducing risk for MDA. We look forward to working with him and the agency in the future on doing so.

So thank you. I'm happy to answer any questions.

[The prepared statement of Ms. Chaplain follows:]

PREPARED STATEMENT BY MS. CRISTINA T. CHAPLAIN

Chairman Udall, Ranking Member Sessions, and members of the subcommittee: I am pleased to be here today to discuss the progress made and challenges that remain for the Department of Defense's (DOD) Missile Defense Agency (MDA) in developing and fielding the Ballistic Missile Defense System (BMDS). Since MDA was established in 2002, it has spent over $90 billion to provide protection from enemy ballistic missiles by developing battle management systems, sensors that identify incoming threats, and missiles to intercept them. MDA plans to spend about $7.5 billion per year through 2018. Since its inception, MDA has been operating in an environment of tight timeframes for delivering capabilities—first with a presidential directive in 2002 and then with a presidential announcement in 2009 on U.S. missile defense in Europe. It is now also operating in an environment of growing budgetary constraints, which have already necessitated tough trade-off decisions and will require additional steps to reduce acquisition risk. At the same time, MDA is undergoing significant transition. In addition to a recent change in the agency's leadership, MDA is responding to the Secretary of Defense's March 2013 announcement to increase the planned numbers of ground-based interceptors designed to protect the United States as well as to changes in plans for U.S. missile defense in Europe.

Since the 2002 National Defense Authorization Act, we have been mandated to prepare annual assessments of MDA's progress toward its acquisition goals.[1] The National Defense Authorization Act for Fiscal Year 2012 required us to report on our assessment of the extent to which MDA has achieved its stated acquisition goals and objectives, as reported through their acquisition baselines, and also to include any other findings and recommendations on MDA acquisition programs and accountability as appropriate.[2] We recently issued our report responding to this mandate.[3] This testimony highlights our findings from that report as well as relevant findings from several of our prior reports on missile defense issued from September 2008 through July 2012, particularly as they relate to the progress MDA made this year in reducing acqusiition risks and the challenges that still face MDA.[4]

To assess MDA's progress and related challenges, we examined the acquisition accomplishments of individual missile defense programs and supporting efforts that MDA is currently developing and fielding. We conducted this work in accordance with generally accepted government auditing standards. Additional information on our scope and methodology is available in our April 2013 and prior issued reports.

BACKGROUND

MDA's BMDS is being designed to counter ballistic missiles of all ranges—short, medium, intermediate, and intercontinental. Because ballistic missiles have different ranges, speeds, sizes, and performance characteristics, MDA is developing multiple systems that, when integrated, provide multiple opportunities to destroy ballistic missiles before they can reach their targets. The BMDS architecture includes space-based sensors, 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.

Table 1 provides a brief description of individual BMDS systems, which MDA refers to as elements of the BMDS. As noted in the table, two programs were proposed for cancellation in April 2013 as part of DOD's fiscal year 2014 President's budget submission.

TABLE 1: DESCRIPTION OF SELECTED BALLISTIC MISSILE DEFENSE SYSTEM (BMDS) ELEMENTS AND SUPPORTING EFFORTS

BMDS element/supporting effort	Description and key components
Aegis Ballistic Missile Defense (BMD) with Standard Missile-3 (SM–3) Block IA and Block IBa.	Aegis BMD is a sea-based system developed for ballistic missile defense and other missions. MDA is developing several versions of SM–3 and associated ship-based software and processors. The first two variants of SM–3 missiles are referred to as Block IA and Block IB. The SM–3 Block IB features additional capabilities over the Block IA to identify, discriminate, and track objects during flight.
Aegis Ashore	A land-based, or ashore, version of Aegis BMD initially using SM–3 Block IB missiles, with plans to use various versions of SM–3 missiles and Aegis weapon system software as they become available.

[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] Pub. L. No. 112–81, § 232 (2011).

[3] GAO, Missile Defense: Opportunity to Refocus on Strengthening Acquisition Management, GAO–13–432 (Washington, DC: Apr. 26, 2013).

[4] GAO–13–432; GAO, Missile Defense: Opportunity Exists to Strengthen Acquisitions by Reducing Concurrency, GAO–12–486 (Washington, DC: Apr. 20, 2012); Schedule Best Practices Provide Opportunity to Enhance Missile Defense Agency Accountability and Program Execution, GAO–12–720R (Washington, DC: July 19, 2012); Space and Missile Defense Acquisitions: Periodic Assessment Needed to Correct Parts Quality Problems in Major Programs, GAO–11–404 (Washington, DC: June 24, 2011); Missile Defense: Actions Needed to Improve Transparency and Accountability, GAO–11–372 (Washington, DC: Mar. 24, 2011); Defense Acquisitions: Many Analyses of Alternatives Have Not Provided a Robust Assessment of Weapon System Options, GAO–09–665 (Washington, DC: Sept. 24, 2009); Defense Acquisitions: Sound Business Case Needed to Implement Missile Defense Agency's Targets Program, GAO–08–1113 (Washington, DC: Sept. 26, 2008).

TABLE 1: DESCRIPTION OF SELECTED BALLISTIC MISSILE DEFENSE SYSTEM (BMDS) ELEMENTS AND SUPPORTING EFFORTS—Continued

BMDS element/supporting effort	Description and key components
Aegis BMD SM–3 Block IIA	The SM–3 Block IIA is planned to be larger than the SM–3 Block IB and is planned to have increased velocity, range, and discrimination capabilities.
Aegis BMD SM–3 Block IIB	The SM–3 Block IIB was planned to address different threats and have more advanced capabilities than earlier SM–3 versions. Key components had not yet been finalized before DOD proposed canceling the program in April 2013 as part of its fiscal year 2014 President's budget submission.
BMDS Sensors	MDA has fielded and/or upgraded a variety of sensors that support various elements of the BMDS including: the Army Navy/Transportable Radar Surveillance and Control Model 2 (AN/TPY–2) radar; the Sea-Based X-Band radar; upgraded early warning radars; and the Cobra Dane radar.
Command, Control, Battle Management, and Communications (C2BMC) [1].	A global network that links and integrates individual missile defense elements. It also allows users to plan ballistic missile defense operations, see the battle develop, and manage networked sensors and weapon systems.
Ground-based Midcourse Defense (GMD)	A ground-based missile defense system with interceptors located at Fort Greely, AK, and Vandenberg, CA. The interceptor consists of a three-stage booster with a kill vehicle on top that can steer itself into the threat missile to destroy it. There are currently two versions of the kill vehicle: the Capability Enhancement-I (CE–I) and the upgraded design known as the Capability Enhancement-II (CE–II).
Precision Tracking Space System (PTSS)	A new constellation of nine satellites planned to provide high-quality track information on threat missiles to other ballistic missile defense systems, DOD proposed canceling the program in April 2013 as part of its fiscal year 2014 President's budget submission.
Targets and Countermeasures	MDA develops and manufactures highly complex targets to present realistic threat scenarios during BMDS flight tests. Our testimony focuses on medium-range air-launched targets being flown for the first time in fiscal year 2013.
Terminal High Altitude Area Defense (THAAD)	A mobile, ground-based missile defense system organized as a battery which includes interceptors, launchers, an AN/TPY–2 radar, a fire control and communications system, and other support equipment.

Source: Missile Defense Agency (data); GAO (presentation).

[1] Details on the acquisition progress of the Aegis BMD SM–3 Block IA and C2BMC elements were not covered in our April 2013 report.

When MDA was established in 2002, the Secretary of Defense granted it exceptional flexibility to set requirements and manage the acquisition of the BMDS in order to quickly deliver protection against ballistic missiles. This decision enabled MDA to rapidly deliver assets but we have reported that it has come at the expense of transparency and accountability.[5] Moreover, to meet tight deadlines, MDA has employed high-risk acquisition strategies that have resulted in significant cost growth, schedule delays, and in some cases, performance shortfalls. Examples of key problems we have cited in reports in recent years are highlighted below.

- In recent years, MDA has experienced several test failures. These, as well as a test anomaly and delays, disrupted MDA's flight test plan and the acquisition strategies of several components.[6] Overall, these issues forced MDA to suspend or slow production of three out of four interceptors being manufactured. The GMD program in particular has been disrupted in its attempts to demonstrate the CE–II interceptors by two test failures. As a result of a failed flight test in January 2010 due to an assembly process quality issue, MDA added a retest designated as Flight Test GMD–06a (FTG–06a). However, this retest also failed in December 2010 due to the effects of vibration on the kill vehicle's guidance system. As a result of these failures, MDA decided to halt GMD flight testing and restructure its multiyear flight test program, halt production of the GMD interceptors, and redirect resources to return-to-flight testing activities. Additionally, as we reported in April 2013, the costs to demonstrate and fix CE–II capability

[5] GAO–11–372 and GAO–12–486.
[6] GAO–12–486.

have grown from $236 million to over $1.2 billion and are continuing to grow.[7]

- MDA acquisitions have faced significant cost growth, schedule delays, and/or performance shortfalls due to a highly concurrent acquisition approach.[8] Concurrency is broadly defined as the overlap between technology development and product development or between product development and production. While some concurrency is understandable, committing to product development before requirements are understood and technologies are mature or committing to production and fielding before development is complete is a high-risk strategy that often results in performance shortfalls, unexpected cost increases, schedule delays, and test problems. High levels of concurrency were present in MDA's initial efforts and remain present in current efforts.
- There has been limited visibility into cost and schedule progress associated with the BMDS. We have reported on the limited usefulness of MDA's acquisition baselines for oversight due to: (1) a lack of clarity, consistency, and completeness; (2) a lack of high-quality supporting cost estimates and schedules; and (3) instability in the content of the baselines.[9]
- MDA has made limited progress in developing the individual system models it uses to assess performance of the BMDS elements and linking those models.[10] Models and simulations are critical to understanding BMDS capabilities. The complex nature of the BMDS, with its wide range of connected elements, requires integrated system-level models and simulations to assess its performance in a range of system configurations and engagement conditions.
- Quality issues have also impeded missile defense development in recent years.[11] These were due to workmanship issues, the use of undocumented and untested manufacturing processes and poor control of manufacturing materials, among other factors.

Congress and DOD have taken steps in recent years to address concerns over MDA's acquisition management strategy, accountability, and oversight. These include efforts to provide more information on cost, schedule, and other baselines; efforts to prevent quality problems; and efforts to begin obtaining independent cost estimates.

MDA HAS MADE PROGRESS ON TESTING, REDUCING SOME ACQUISITION RISKS, AND IMPROVING THE CLARITY OF THE BASELINES

In April 2013, we reported that in the past year MDA gained important knowledge through its test program, including successfully conducting its most complex integrated air and missile defense flight test to date, and it took some positive steps to reduce acquisition risks for two of its programs. It has also improved the clarity of baseline information it reports to Congress.[12]

Specifically, in April 2013 we reported that in October 2012, MDA conducted the largest integrated air and missile defense flight test to date, achieving near simultaneous intercepts of multiple targets by various BMDS interceptors. This test was a combined developmental and operational flight test that for the first time used warfighters from multiple combatant commands and employed multiple missile defense systems. All five targets—three ballistic and two cruise missiles—were launched and performed as expected. In this test, THAAD also intercepted a medium-range target for the first time and an Aegis ship conducted successfully a standard missile-2 Block IIIA engagement against a cruise missile. This test also provided valuable data to evaluate interoperability between several systems during a live engagement.

In April 2013, we reported that in fiscal year 2012, the Aegis BMD SM–3 Block IB and THAAD programs also attained important knowledge in their flight test programs. In May 2012, the Aegis BMD SM–3 Block IB system intercepted a short-range target for the first time. In June 2012, the system completed another successful intercept which provided more insight into the missile's enhanced ability to discriminate the target from other objects during an engagement. In October 2011, THAAD successfully conducted its first operational flight test prior to entering full-

[7] GAO–13–432.
[8] GAO–12–486 and GAO–13–432.
[9] GAO–11–372, GAO–12–720R, and GAO–13–432.
[10] GAO–13–432, GAO–12–486, and GAO–11–372.
[11] GAO–11–404.
[12] GAO–13–432.

rate production.[13] During the test, THAAD fired two missiles that intercepted two short-range targets, demonstrating that the system can perform under operationally realistic conditions from mission planning through the end of the engagement. Additionally, this test supported the resumption of interceptor manufacturing, and was used by the Army as support for accepting the first two THAAD batteries. This also marked the first time Army and DOD test and evaluation organizations confirmed that the test and its results resembled the fielded system.

We also reported in April 2013 that MDA took steps to reduce acquisition risk by decreasing the overlap between technology and product development for two of its programs—the Aegis BMD SM–3 Block IIA and Block IIB programs.[14] By taking steps to reconcile gaps between requirements and available resources before product development begins, MDA makes it more likely that programs can meet cost, schedule, and performance targets. The Aegis BMD SM–3 Block IIA program added time and money to extend development following significant problems with four components. MDA reduced its acquisition risk by delaying the program's system preliminary design review for more than 1 year and, as a result, in March 2012, the program successfully completed the review because it allowed additional development of the components. We also reported in April 2013 that the Aegis BMD SM–3 Block IIB program had taken important steps to reduce concurrency and increase the technical knowledge it planned to achieve before development by delaying product development until after its preliminary design review was completed.

Lastly, in April 2013 we reported that MDA has taken steps to improve the clarity of its acquisition baselines since we reported on these issues in March 2011. Although MDA is not yet required to establish an acquisition program baseline pursuant to 10 U.S.C. § 2435 and related DOD policy because of the acquisition flexibilities it has been granted, Congress has enacted legislation requiring MDA to establish some baselines. MDA reported baselines for several BMDS programs to Congress for the first time in its June 2010 BMDS Accountability Report (BAR) to respond to statutory requirements in the National Defense Authorization Act for Fiscal Year 2008.[15] MDA's baselines, including resource and schedule baselines, are reported in the BAR and are updated annually. MDA's 2012 resource baselines report costs for all the categories of the life cycle—research and development, procurement, military construction, operations and support, and disposal costs.[16] Schedule baselines include key milestones and tasks, such as important decision points, significant increases in performance knowledge, modeling and simulation events, and development efforts. Some also show timeframes for fight and ground tests, fielding, and events to support fielding.

In its 2012 BAR, MDA made several useful changes to its reported resource and schedule baselines in response to our concerns and congressional direction. For example, MDA:

- reported the full range of life cycle costs borne by MDA;
- defined and explained more clearly what costs are in the resource baselines or were excluded from the estimates;
- included costs already incurred in the unit cost for Targets and Countermeasures so they were more complete;
- added a separate delivery table that provided more detailed information on deliveries and inventories; and
- added a list of significant decisions made or events that occurred in the past year—either internal or external to the program—that affected program progress or baseline reporting.

MDA CONTINUES TO FACE A VARIETY OF ACQUISITION CHALLENGES

Although the MDA has made some progress, the new MDA Director faces considerable challenges in executing acquisition programs; strengthening accountability;

[13] Pursuant to MDA's acquisition flexibilities, once an element enters the production and deployment phase, the element enters the formal DOD acquisition system. Consequently, 10 U.S.C.§ 2366 requires completion of realistic survivability testing of a weapon system before a program can begin full-rate production.

[14] GAO–13–432.

[15] Pub. L. No. 110–181, § 223(g), repealed by Pub. L. No. 112–81, § 231(b) (2011).

[16] Research and development costs include development and design costs for system engineering and design, test and evaluation, and other costs for system design features. Procurement costs include total production and deployment costs (e.g., site activation, training) of the prime system and its related support equipment and facilities. Military construction costs include costs for major construction such as bases and buildings. Operations and support costs include costs of operating and supporting the fielded system, including all direct and indirect costs incurred in using the system (e.g., personnel, maintenance, and sustaining investment). Disposal, or inactivation, costs include the costs of disposing of the prime equipment after its useful life.

assessing alternatives before making new investment commitments; developing and deploying U.S. missile defense in Europe and using modeling and simulations to understand capabilities and limitations of the BMDS.

Challenge: Executing Acquisition Programs

In April 2013 we reported that though MDA has gained important insights through testing and taken some steps to reduce acquisition risk and increase transparency, it still faces challenges stemming from high-risk acquisition strategies. As noted earlier, MDA has undertaken and continues to undertake highly concurrent acquisitions. While some concurrency is understandable, committing to product development before requirements are understood and technologies are mature or committing to production and fielding before development is complete is a high-risk strategy that often results in performance shortfalls, unexpected cost increases, schedule delays, and test problems. It can also create pressure to keep producing to avoid work stoppages.

Our April 2012 report detailed how the Aegis BMD SM–3 Block IB, GMD, and THAAD programs undertook highly concurrent acquisition strategies.[17] For example, to meet the presidential directive to deploy an initial set of missile defense capabilities by 2004, the GMD program concurrently matured technology, designed the system, tested the design, and produced and deployed an initial set of missile defense capabilities. CE–I interceptors were rapidly delivered to the warfighter but they required an expensive retrofit and refurbishment program that is still ongoing. Similarly, MDA proceeded to concurrently develop, manufacture, and deliver 12 of the next generation of interceptors, the CE–IIs. They were also delivered prematurely to the warfighter and will require an extensive and expensive retrofit.

In April 2012, we also reported that the Aegis Ashore and PTSS programs were adopting acquisition strategies with high levels of concurrency. The Aegis Ashore program, for instance, began product development on two systems—one designated for testing and the other operational—and set the acquisition baseline before completing the preliminary design review. Best practices, by contrast, call for such baselines to be set after this review because the review process is designed to ensure the program has sufficient knowledge about resources and requirements before engaging in large-scale acquisition activities. Similarly, for its new PTSS, MDA planned to develop and produce two industry-built satellites while a laboratory-led contractor team was still in the development phase of building two lab development satellites. Such an approach would not enable decisionmakers to fully benefit from the knowledge about the design to be gained from on-orbit testing of the laboratory-built satellites before committing to the next industry-built satellites.

In our April 2013 report, we noted that the concurrent high risk approaches for the GMD and Aegis BMD SM–3 Block IB programs were continuing to have negative effects, while the THAAD program was able to overcome most of its issues.[18] For instance, discovery of the CE–II design problem while production was already under way increased MDA costs to demonstrate and fix CE–II capability from approximately $236 million to over $1.2 billion, due to the costs of additional flight tests including the target and test-range, investigating the failure, developing failure resolutions, and fixing the already delivered missiles. Costs continue growing because MDA further delayed the next intercept test planned for fiscal year 2012. At this time, the next intercept test date is not yet determined as MDA is considering various options. While the Aegis BMD SM–3 Block IB program slowed production to address developmental issues that arose when the program experienced a failure and a flight anomaly in early flight tests, it experienced further difficulties completing testing of a new maneuvering component—contributing to delays for a third flight test needed to validate the interceptor's capability.

We also reported in April 2013 that MDA was continuing to follow high risk acquisition strategies for its Aegis Ashore, PTSS, and Targets and Countermeasures programs. For example, this year we reported that the Targets and Countermeasures acquisition strategy is adding risk to an upcoming complex, costly operational flight test involving multiple MDA systems because it plans to use unproven targets. Using these new targets puts this major test at risk of not being able to obtain key information should the targets not perform as expected. Developmental issues with this new medium-range target as well as identification of new software requirements have already contributed to delaying the test, which was originally planned for the fourth quarter of fiscal year 2012 and is now planned for the fourth quarter of fiscal year 2013.

[17] GAO–12–486.
[18] GAO–13–432.

In 2012, we recommended MDA make adjustments to the acquisition schedules to reduce concurrency.[19] DOD agreed and partially addressed the recommendation. Specifically, MDA reduced concurrency in the Aegis BMD SM–3 Block IIA and Block IIB programs, but continues to include high levels of concurrency in other programs as discussed above. We also recommended in 2013 that the Secretary of Defense direct MDA's new Director to add non-intercept flight tests for each new type of target missile developed to reduce risk.[20] DOD partially concurred, stating that the decision to perform a non-intercept target test must be balanced against cost, schedule, and programmatic impacts. While there may be exceptions that need to occur when there is a critical warfighter need, we believe, whenever possible, that MDA should avoid using undemonstrated targets, particularly for costly and complex major operational tests.

Challenge: Strengthening Accountability by Ensuring Program Baselines Support Oversight

In April 2013, we reported that while MDA made substantial improvements to the clarity of its reported resource and schedule baselines in fiscal year 2012, it has made little progress improving the quality of its cost estimates that support its resource baseline since we made a recommendation to improve these estimates in our March 2011 report.[21] In particular, MDA's resource baselines are not yet sufficiently reliable, in part because they do not include costs from military services in reported life cycle costs for its programs. Instability due to MDA's frequent adjustments to its acquisition baselines also makes assessing progress over time extremely difficult and, in many cases, impossible. Despite some positive steps forward since 2004, the baselines are of limited use for meaningfully assessing BMDS cost and schedule progress.

In our March 2011 report, we assessed MDA life cycle cost estimates using the GAO Cost Estimating and Assessment Guide.[22] We found that the cost estimates we assessed, that were used to support MDA's resource baselines, were not comprehensive, lacked documentation, were not completely accurate, or were not sufficiently credible. In April 2013 we reported that, in June 2012, MDA completed an internal Cost Estimating Handbook, largely based on our guide which, if implemented, could help address nearly all of the shortfalls we identified. Because the Handbook was only recently completed, it is too early to assess whether the quality of MDA's cost estimates have improved. In our April 2013 report, we found that while the agency made improvements to its reported resource baselines to include all of the life cycle costs funded by MDA from development through retirement of the program, the baselines do not include operation and support costs funded by the individual military services.[23] According to our guide, cost estimates should be comprehensive. Comprehensive estimates include both the government and contractor costs of the program over its full life cycle, from inception of the program through design, development, deployment, and operation and support to retirement. MDA officials told us in 2011 that MDA does not consider military service operation and support funds to be part of the baselines because the services execute the funds. It is unclear what percentage operation and support costs are in the case of MDA programs because they have not been reported. For programs outside of MDA these costs can be significant, and as a result the reported life cycle costs for some MDA programs could be significantly understated.

In our April 2013 report, we recommended that the Secretary of Defense direct MDA's new Director to include in its resource baseline cost estimates all life cycle costs, specifically the operations and support costs from the military services in order to provide decisionmakers with the full costs of ballistic missile defense systems. DOD partially concurred with this recommendation, agreeing that decisionmakers should have insight into the full life cycle costs of DOD programs, but disagreeing that they should be reported in MDA's BAR. DOD did not identify how the full life cycle costs should be reported. We continue to believe that these costs should be reported because good budgeting requires that the full costs of a project be considered when making decisions to provide resources. In addition, DOD has reported full operation and support costs to Congress for major defense acquisition programs where one military service is leading the development of an acquisition planned to be operated by many Military Services. We also believe that MDA's BAR

[19] GAO–12–486.
[20] GAO–13–432.
[21] GAO–11–372.
[22] GAO–11–372 and GAO, GAO Cost Estimating and Assessment Guide, GAO–09–3SP (Washington, DC: March 2009).
[23] GAO–13–432.

is the most appropriate way to report the full costs to Congress because it already includes the acquisition costs and the MDA funded operation and support costs.

In July 2012, we also used our Schedule Assessment Guide to assess five MDA program schedules that support the baselines and found that none fully met the best practices identified in the guide.[24] For example, three programs took steps to ensure resources were assigned to their schedule activities, but one program did not do so and the other only partially did so. Moreover, none of the five programs we reviewed had an integrated master schedule for the entire length of acquisition as called for by the first best practice, meaning the programs are at risk for unreliable completion estimates and delays. DOD concurred with our recommendations to ensure that best practices are applied to those schedules as outlined in our guide, and MDA programs have taken some actions to improve their schedules, though they have not yet had time to fully address our recommendations. We plan to continue to monitor their progress because establishing sound and reliable schedules is fundamental to creating realistic schedule and cost baselines.

Lastly, as we reported in March 2009, in order for baselines to be useful, they need to be stable over time so progress can be measured and so that decisionmakers can determine how to best allocate limited resources.[25] In April 2013, we reported that most major defense acquisition programs are required to establish baselines prior to beginning product development.[26] These baselines, as implemented by DOD, include key performance, cost, and schedule goals. Decisionmakers can compare the current estimates for performance, cost, and schedule goals against a baseline in order to measure and monitor progress. Identifying and reporting deviations from the baseline in cost, schedule, or performance as a program proceeds provides valuable information for oversight by identifying areas of program risk and its causes.

However, as we reported in April 2013, MDA only reports annual progress by comparing its current estimates for unit cost and scheduled activities against the prior year's estimates. As a result, MDA's baseline reports are not useful for tracking longer term progress. When we sought to compare the latest 2012 unit cost and schedule estimates with the original baselines set in 2010, we found that because the baseline content had been adjusted from year to year, in many instances the baselines were no longer comparable. I would like to highlight the problems we identified in Aegis Ashore to illustrate how these adjustments limited visibility into cost or schedule progress. MDA prematurely set the Aegis Ashore baseline before program requirements were understood and before the acquisition strategy was firm. The program has subsequently added significant content to the resource baseline to respond to acquisition strategy changes and requirements that were added after the baseline was set. In addition, activities from Aegis Ashore's 2010 BAR schedule baseline were split into multiple events, renamed, or eliminated altogether in the program's 2012 BAR schedule baseline. MDA also redistributed planned activities from the Aegis Ashore schedule baselines into several other Aegis BMD schedule baselines. These major adjustments in program content made it impossible to understand annual or longer-term program cost progress. Rearranging content to other baselines also made tracking the progress of these activities very difficult and in some cases impossible.

We recommended in our April 2013 report that the Secretary of Defense direct MDA's new Director to stabilize the acquisition baselines so that meaningful comparisons can be made over time that support oversight of those acquisitions. DOD concurred with this recommendation.

Other Challenges Reported by GAO

Our April 2013 report discussed a variety of other challenges facing MDA that I would like to highlight today. First, in light of growing fiscal pressures, it is becoming increasingly important that MDA have a sound basis before investing in new efforts. But MDA has not analyzed alternatives in a robust manner before making recent commitments. Second, during the past several years, MDA has been responding to a mandate from the President to develop and deploy new missile defense systems in Europe for defense of Europe and the United States. Our work continues to find that a key challenge facing DOD is to keep individual system acquisitions synchronized with the planned timeframes of the overall U.S. missile defense capability planned in Europe. Third, MDA also is challenged by the need to develop the

[24] GAO–12–720R.

[25] GAO–09–3SP.

[26] A baseline description for a major defense acquisition program or any designated major subprogram under the program shall be prepared . . . before the program or subprogram enters system development and demonstration; before the program or subprogram enters production and deployment, and before the program or subprogram enters full rate production. 10 U.S.C. § 2435.

tools—the models and simulations—to understand the capabilities and limitations of the individual systems before they are deployed, which will require the agency to overcome technical limitations in the current approach to modeling missile defense performance. While MDA recently committed to a new approach in modeling and simulation that could enable them to credibly model individual programs and system-level BMDS performance, warfighters will not benefit from this effort until two of the currently planned three phases for U.S. missile defense in Europe have already been deployed in 2011 and 2015 respectively.

Analyses of Alternatives Could Help MDA Balance and Prioritize Its Portfolio of Investments

Because MDA faces growing fiscal pressure as it develops new programs at the same time as it supports and upgrades existing ones, DOD and MDA face key challenges getting the best value for its missile defense investments. We have frequently reported on the importance of establishing a sound basis before committing resources to developing a new product.[27] We have also reported that part of a sound basis is a full analysis of alternatives (AOA).[28] The AOA is an analytical study that is intended to compare the operational effectiveness, cost, and risks of a number of alternative potential solutions to address valid needs and shortfalls in operational capability. A robust AOA can provide decisionmakers with the information they need by helping establish whether a concept can be developed and produced within existing resources and whether it is the best solution to meet the warfighter's needs. Major defense acquisition programs are generally required by law and DOD's acquisition policy to conduct an AOA before they are approved to enter the technology development phase. Because of the flexibilities that have been granted to MDA, its programs are not required to complete an AOA before starting technology development. Nevertheless, MDA's acquisition directive requires programs to show they have identified competitive alternative materiel solutions before they can proceed to MDA's technology development phase. However, this directive provides no specific guidance on how this alternatives analysis should be conducted or what criteria should be used to identify and assess alternatives, such as risks and costs.

We reported in February 2013 that the Aegis BMD SM–3 Block IIB had not conducted a robust alternatives analysis and also reported in April 2013 that MDA did not conduct robust alternatives analyses for the PTSS program. Both of these programs were recently proposed for cancellation in the fiscal year 2014 President's budget submission. In our April 2013 report, we recommended that the Secretary of Defense direct the new MDA Director to undertake robust alternatives analyses for new major missile defense efforts currently underway and before embarking on other new missile defense programs. Doing so can help provide a foundation for developing and refining new program requirements, understanding the technical feasibility and costs of alternatives and help decisionmakers determine how to balance and prioritize MDA's portfolio of BMDS investments. DOD concurred with our recommendation but asserted MDA already performs studies and reviews that function as analyses of alternatives. We have found, however, that these studies are not sufficiently robust.

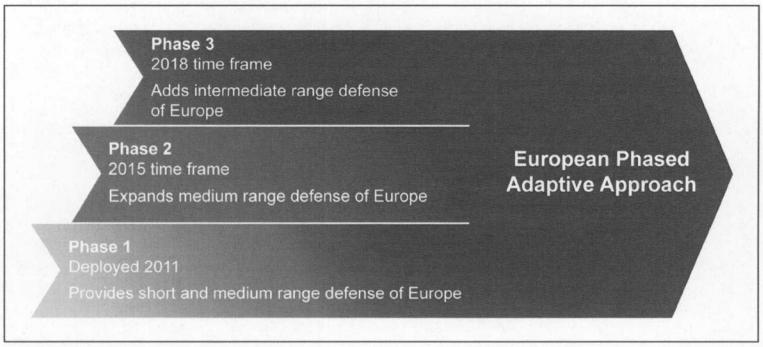
Developing and Deploying U.S. Missile Defense in Europe

In September 2009, the President announced a new approach to provide U.S. missile defense in Europe. This four-phase effort was designed to rely on increasingly capable missiles, sensors, and command and control systems to defend Europe and the United States. In March 2013, the Secretary of Defense canceled Phase 4, which called for Aegis BMD SM–3 Block IIB interceptors, and announced several other plans, including deploying additional ground based interceptors in Fort Greely, AK, and deploying a second AN/TPY–2 radar in Japan. DOD declared the first phase of U.S. missile defense in Europe operational in December 2011. The current three-phase effort is shown in figure

[27] GAO–08–1113; Defense Acquisitions: Improved Business Case Is Needed for Future Combat System's Successful Outcome, GAO–06–367 (Washington, DC: Mar. 14, 2006); and Tactical Aircraft: Air Force Still Needs Business Case to Support F/A–22 Quantities and Increased Capabilities, GAO–05–304 (Washington, DC: Mar. 15, 2005).

[28] GAO–09–665 and Homeland Security: DHS Requires More Disciplined Investment Management to Help Meet Mission Needs, GAO–12–833 (Washington, DC: Sept. 18, 2012).

Figure 1: Three-Phase U.S. Approach to Missile Defense in Europe



Source: GAO analysis of President's September 17, 2009, policy announcement, Secretary of Defense briefing on Missile Defense on March 15, 2013, and MDA and DOD data.

We reported in April 2012 that in order to meet the 2009 presidential announcement to deploy missile defenses in Europe, MDA has undertaken and continues to undertake highly concurrent acquisitions. We reported in April 2013 that, according to MDA documentation, system capabilities originally planned for the first three phases are facing delays, either in development or in integration and testing.

- The systems delivered for Phase 1 do not yet provide the full capability planned for the phase. Phase 1 was largely defined by existing systems that could be quickly deployed because of the limited time between the September 2009 announcement and the planned deployment of the first phase in 2011. MDA planned to deploy the first phase in two stages—the systems needed for the phase and then upgrades to those systems in 2014. However, an MDA official told us that MDA now considers the system upgrades stage to be part of the second phase, which may not be available until the 2015 timeframe.
- For Phase 2, some capabilities, such as an Aegis weapon system software upgrade, may not yet be available. MDA officials stated they are working to resolve this issue.
- For Phase 3, some battle management and Aegis capabilities are currently projected to be delayed.
- We recommended in our April 2012 report that DOD review the extent to which capability delivery dates announced by the President in 2009 were contributing to concurrency in missile defense acquisitions and identify schedule adjustments where significant benefits could be obtained by reducing concurrency. DOD concurred with this recommendation.

Modeling and Simulation Limitations

We reported in April 2013 that a key challenge for both the Director of MDA and the warfighter is understanding the capabilities and limitations of the systems MDA is going to deploy, particularly given the rapid pace of development. According to MDA's fiscal year 2012 President's budget submission, models and simulations are critical to understanding BMDS operational performance because assessing performance through flight tests alone is prohibitively expensive and can be affected by safety and test range constraints.[29] In August 2009, U.S. Strategic Command and the BMDS Operational Test Agency jointly informed MDA of a number of system-level limitations in MDA's modeling and simulation program that adversely affected their ability to assess BMDS performance. Since then, we reported in March 2011 and again in April 2012 that MDA has had difficulty developing its models and sim-

[29] A model is a representation of an actual system that involves computer simulations that can be used to predict how the system might perform or survive under various conditions or in a range of hostile environments. A simulation is a method for implementing a model. It is the process of conducting experiments with a model for the purpose of understanding the behavior of the system modeled under selected conditions or of evaluating various strategies for the operation of the system within the limits imposed by developmental or operational criteria. Simulation may include the use of digital devices, laboratory models, or "test bed" sites.

ulations to the point where it can assess operational performance. In April 2013, we reported that MDA recently committed to a new approach in modeling and simulation that officials stated could enable them to credibly model individual programs and system-level BMDS performance by 2017.[30] To accomplish this, MDA will use only one simulation framework, not two, to do ground testing and performance assessments. With one framework, the agency anticipates data quality improvements through consistent representations of the threat, the environment, and communications at the system level. Without implementing these changes, MDA officials told us it would not be possible to credibly model BMDS performance by 2017, in time to assess the third phase of U.S. missile defense in Europe.

MDA program officials told us that the next major assessment of U.S. missile defense in Europe for the 2015 deployment will continue to have many of the existing shortfalls. As a result, MDA is pursuing initiatives to improve confidence in the realism of its models in the near term, one of which involves identifying more areas in the models where credibility can be certified by the BMDS Operational Test Agency. Another focuses on resolving the limitations identified jointly by the Operational Test Agency and U.S. Strategic Command. Lastly, MDA officials told us they are refining the process used to digitally recreate system-level flight tests in order to increase confidence in the models.

Because MDA recently committed to a new approach for modeling and simulation, we did not make recommendations in our 2013 report. However, it is important that this effort receive sufficient management attention and resources, given past challenges and the criticality of modeling and simulation.

In conclusion, many of the challenges I have highlighted today are rooted in both the schedule pressures that were placed on MDA when the agency was directed in 2002 to rapidly field an initial missile defense capability and the flexibilities that were granted MDA so that it could do so. Today, however, initial capability is in place; MDA has begun to transition more mature systems to the military services; it has had to propose canceling two major efforts in the face of budget reductions, concerns about affordability, and technical challenges; and the employment of BMDS systems is becoming increasingly interdependent, thereby increasing the potential consequences of problems discovered late in the development cycle. In recent years, both Congress and MDA have recognized that conditions have changed and steps need to be taken that reduce acquisition risk, while increasing transparency and accountability. However, especially in light of growing budget pressures, additional actions are needed, including

- sufficiently analyzing alternatives before making major new investment commitments;
- stabilizing acquisition baselines and ensuring they are comprehensive and reliable;
- ensuring acquisition strategies allow for the right technical and programmatic knowledge to be in place before moving into more complex and costly phases of development; and
- demonstrating new types of targets in less critical tests before they are used in a major test in order to lower testing risks

The appointment of a new Director provides an opportunity to address these challenges, but doing so will not be easy as MDA is still under significant schedule pressures and the agency is undergoing a transition to respond to new Secretary of Defense direction to expand the GMD capabilities. As such, we look forward to continuing to work with MDA to identify and implement actions that can reduce acquisition risk and facilitate oversight and better position MDA to respond to today's demands.

Chairman Udall, Ranking Member Sessions, and members of the subcommittee, this concludes my statement. I am happy to answer any questions you have.

GAO CONTACT AND STAFF ACKNOWLEDGMENTS

For future questions about this statement, please contact me at (202) 512–4841 or chaplainc@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. Individuals making key contributions to this statement include David B. Best, Assistant Director; Aryn Ehlow; Ivy Hübler; Meredith Allen Kimmett; Wiktor Niewiadomski; Kenneth E. Patton; John H. Pendleton; Karen Richey; Brian T. Smith; Steven Stern; Robert Swierczek; Brian Tittle; and Hai V. Tran.

[30] GAO–13–432.

Senator UDALL. Thank you, Ms. Chaplain.

Let's do 7-minute rounds. I'll start.

Admiral, I'd like to start with you. We here in Congress imposed an indiscriminate budget reduction process called sequestration for the fiscal year 2013. We hear it's caused real problems across DOD as well as every other government agency. Unless we act to change it or end it, it will happen again in fiscal year 2014.

You manage a lot of complex acquisition programs. I think your budget's $7 to $8 billion a year, in that neighborhood. Could you tell us the following information about the impact of sequestration. I have the three questions I'll pose and then you can have at them: What's been the impact of sequester in this year, fiscal year 2013? What would be the importance of approving the planned reprogramming request and the effect of not doing so relative to sequestration? What would be the effect on MDA if the sequester were to continue in fiscal year 2014?

Admiral SYRING. Thank you, Mr. Chairman. I'll address three, in this order. There is impact to the MDA and our programs due to sequester. The budget reduction was approximately $683 million that was flowed down from the fiscal year 2013 appropriation. That was taken in a nondiscriminate way and it is not the best way in my opinion to have levied those budget reductions.

We have proposed through the reprogramming action to DOD, which will come over together, a better way to take those cuts to sustain what I believe to be the agency's highest priorities. The importance of that support is critical.

Finally, on the potential impact of 2014 sequestration and those reductions, I would say, sir, that those would be as cumbersome or maybe more cumbersome given the cuts in 2013 coupled with the cuts in 2014.

Senator UDALL. Thank you for that illumination. I know all of you in your statements have further elaborated on this. The committee would welcome all the details, all the numbers, because this is something that's very important facing us.

General Formica, Secretary of Defense Hagel, Admiral Winnefeld, and General Jacoby have all said recently that the current ground-based midcourse defense system defends all of the United States, including the east coast, against missile threats from both North Korea and Iran. In your capacity as commander within STRATCOM, you represent the warfighter perspective on our missile defense capabilities and requirements. Do you have confidence in our current GMD system to defend all of the United States, including the east coast, against current and near-term ballistic missile threats from both North Korea and Iran?

General FORMICA. Yes, Mr. Chairman. Thank you for the question. We do have confidence in the ability of the ballistic missile defense system to defend the United States against a limited attack from both North Korea and Iran today and in the near future. I'm confident in the systems that have been provided to us and I'm confident in the ability and training of the soldiers, sailors, airmen, marines, and civilians that operate those systems.

Senator UDALL. Let me turn to Secretary Creedon with a question tied to the question I just posed to the General. Some have suggested there may be a gap in our Homeland defense coverage,

particularly the east coast, against a possible future Iranian ICBM threat if we do not move now to build a missile defense site on the east coast. This view seems to completely overlook the fact that we do already have a missile defense system in place that protects all the United States, including the east coast, against a potential Iranian ICBM, and that Iran does not yet have an ICBM or nuclear weapons.

It also seems to overlook the fact that we're planning to increase our missile defense interceptor inventory by nearly 50 percent in the next few years and that we're making numerous and significant improvements to our Homeland defense system that will provide even better protection against a future Iranian ICBM threat.

Do I have the basic facts right, and what would you say in response to the suggestion of an imminent gap against possible future Iranian ICBMs and the need now—the need, I should say, to decide now to deploy an east coast site to fill that gap?

Ms. CREEDON. Yes, sir, you do in fact have that string of facts accurate. The east coast is well protected as a result of—it was protected before the additional 14, and this additional 14 provides additional protection both for anything from North Korea as well as anything from Iran should that threat develop. Again, you want to stay ahead of the threat.

There are many options that would be available to us depending on the rapidity with which a threat in your hypothetical from Iran would emerge, not the least of which is, frankly, the ability to look at additional interceptors at Fort Greely, which could also provide some additional threats.

One of the longer-term issues, though, is what are the numbers and what are the capabilities. That's very much in the realm of the unknown and very much out in the future. So right now, just to be clear, DOD is, in fact, carrying through with the direction from the fiscal year 2013 statute. The MDA is currently in the process of developing criteria to identify a candidate list of sites. From that candidate list of sites, there will be a narrowing down to three, maybe more, but at least three, which is what the direction was under the statute. Then environmental impact statements (EIS) will be completed for all of those, and this will allow us, should there be a decision at some point that we do need an east coast missile defense site, this will allow an acceleration of the time that we would need one.

But there are other options and we are well protected with the existing site.

Senator UDALL. Admiral, is there anything you'd want to add about our ongoing and planned improvements to our missile defense capability that would enhance our defenses against a threat that Iran, thankfully, does not yet have?

Admiral SYRING. No, sir. I believe that the first step in the strategy, as Ms. Creedon articulated, is on track and is the best use of resources today to match the threat that we see, to keep ahead of the threat that we see from North Korea, with the second step being what do we need to do to keep ahead of the threat from Iran, and those analyses and studies are ongoing this year to coincide with the completion of the interceptor siting studies that we're doing this year.

Senator UDALL. Let me fit in one short question. This again to you, Admiral: Turning to your authorities for classification for missile defense information in the MDA, with respect to Russia, have you declassified any missile defense information and have you been asked to declassify any missile defense information for Russia?

Admiral SYRING. I have not declassified any information to give to Russia and I have not been asked to declassify any information to give to Russia.

Senator UDALL. Thank you for clarifying the record.

Let me recognize Senator Fischer for 7 minutes.

Senator FISCHER. Thank you, Mr. Chairman.

Senator Lee had asked me if I would defer my question time to him and I will do so.

Senator UDALL. I'm happy to recognize my cousin from the great State of Utah.

Senator LEE. Thank you very much. As one of four or five Senators born in Arizona, I appreciate that.

Thank you, Senator Fischer, for willing to accommodate me. I'll be shuttling back and forth between here and the Judiciary Committee. I appreciate your patience with me.

Thanks to all of you for joining us today. Admiral Syring, I especially appreciated your willingness to visit with me the other day on some of these issues.

The recent aggressive behavior of North Korea and the continued belligerence of Iran's pursuit of a nuclear weapons program tend to show the need for an effective and robust missile defense system is as great as it ever has been before. In light of our country's fiscal situation, we have to ensure that all the missile defense programs are both cost effective and likely to be able to achieve their objectives.

We must also base these decisions, any decision pertaining to U.S. missile defense, solely, exclusively, on the need of the United States to defend the Nation against ballistic missile attacks. It's no secret that the Russian government continues to demand concessions and assurances on our missile defense programs.

Admiral Syring, I was a little alarmed yesterday to hear you suggest that this administration had perhaps discussed or considered declassifying information on our missile defense program in order to ease concerns of the Russian government.

It's also been reported in recent weeks that Under Secretary of Defense for Policy James Miller held consultations with Russian Deputy Defense Minister Anatoly Antonov in Brussels concerning U.S. missile defense. Russian media reported that National Security Adviser Tom Donilon had delivered a message from President Obama to President Putin in April that included proposals on missile defense. This follows reports in March that Russian Defense Minister Sergei Shoigu asked Secretary Hagel for regular talks on missile defense with the United States.

On this topic, I asked Secretary Hagel in the DOD posture hearing just a few weeks ago if these talks with the Russian Government would be taking place and who would be involved. I'm still waiting for a response from Secretary Hagel on that important question.

Why don't we start with you, Admiral Syring. Following up on Senator Udall's question a minute ago, I'd like to discuss what it was that you did say yesterday in the House Armed Services Strategic Forces Subcommittee regarding the declassification of missile defense data. Specifically, what's the nature of the data that is being considered at least for possible declassification, and what can you tell me about the purposes for which this might be up for consideration for declassification?

Admiral SYRING. Yes, sir. The questions that I get asked as the classification authority across the stakeholder spectrum of the Ballistic Missile Defense System (BMDS) from people that care about and work with the BMDS and the MDA in particular come to me every day in terms of classification authority. My staff and the agency and eventually to me are asked consistently is a piece of information classified or not, and we rule on that.

I have been asked many times since I've been the Director to rule on a piece of information in a briefing or a slide. I have been asked by the Office of the Secretary of Defense for Policy on one occasion to rule on a piece of information, missile parameter information, of which I said the information's classified and it will remain classified.

I will turn over to Secretary Creedon for further discussion on the policy issues and discussions that Dr. Miller has had. I want to just finish by saying I did talk to Dr. Miller last night, sir, and he offered to come over and talk to any Senator or any committee member on his specific policy discussions in this area and he just wanted me to tell you that directly, sir.

Senator LEE. Okay. We'll turn to Secretary Creedon in a minute. Just so I understand you, if I'm understanding you correctly you seem to be telling me that we do have a significant national security interest in maintaining the classified status of this data?

Admiral SYRING. Yes, sir, absolutely, and I'm not anxious and I will not cede the advantage of the United States to anybody.

Senator LEE. Okay, thank you.

Secretary Creedon, do you want to follow up on that? Anything to add to that?

Ms. CREEDON. Yes, sir. I just wanted to reemphasize that we have no ability to share any classified information with Russia, nor any intent to share any classified information with Russia. But as Admiral Syring said, in the preparations for some of these meetings that you referenced we wanted to be very clear and very careful about what were the sorts of things that we would begin conversations on missile defense with the Russians, because we wanted to be very clear that we were not getting into any areas that were classified. So we've had multiple discussions about is this classified, is this classified, is this thing classified, to make sure that we're very clear on where we stand.

Senator LEE. Okay. Now, can you confirm that Mr. Donilon, in fact, delivered a message to President Putin regarding missile defense?

Ms. CREEDON. Mr. Donilon had a range of meetings when he was in Moscow, including with President Putin. What he was talking about was expanding and making sure that we have a good relationship with Russia. One of the issues that obviously we all know

has been a burr, frankly, in the relationship is missile defense. So we were looking at ways to reinvigorate some of the discussions with respect to missile defense, because we really haven't had anything of substance in about a year and a half, because it is in the way of talking about other things as well—trade, all sorts of things in the broader relationship.

Senator LEE. So I understand you perhaps wanted to reinitiate some sort of dialogue. Can you tell me anything about the substance of any such communications?

Ms. CREEDON. My understanding, because I wasn't there, but my understanding of that, as well as the subsequent meeting with the Under Secretary of Defense for Policy with Mr. Antonov, the Deputy Minister of Defense, was that a lot of this really was both explaining the decisions that we had made with respect to the hedge, the implementation of the additional 14 GBIs, as well as the decisions with respect to the EPAA, and then also put on the table some things that had been put on the table before, frankly, that could ultimately lead to discussions with respect to both transparency and cooperation with the Russians on missile defense.

But we were also very clear—and I just really want to reemphasize this—that we are not, will not, cannot, agree to anything that restricts either the performance or the geographic locations of our systems.

Senator LEE. Or that would involve handing over classified information?

Ms. CREEDON. Or that would involve handing over classified information.

Senator LEE. Information that Admiral Syring has no intent, desire, willingness to declassify.

Ms. CREEDON. As I said, we have no mechanism to provide them classified information in any event.

Senator LEE. Okay. Thank you.

I see my time has expired. I thank the chairman and thank you, Senator Fischer.

Senator UDALL. Thank you, Senator Lee.

Senator Donnelly.

Senator DONNELLY. Thank you, Mr. Chairman.

This would be for any of you. From a missile defense perspective, what is your greatest concern with North Korea at this time? [Pause.]

You go first, General Formica.

General FORMICA. Senator, I pressed the button, so I'll speak first.

Thank you for asking the question. You know we're still at the middle of the period of provocation with the North Koreans.

Senator DONNELLY. Yes, we are.

General FORMICA. We're concerned about what North Korea will do. We're obviously concerned about the degree of predictability that the leader from North Korea has demonstrated or lack of predictability. So it's important to us that we maintain a posture so that we can defend the United States of America both at home and abroad against the threats that North Korea would pose.

Senator DONNELLY. In terms of engagement if a missile is sent by North Korea, obviously we have protective systems in Guam in

place and others in place. Do we feel confident that all of our friends and allies will be protected as well by the missile defense shield that we've put in place?

General FORMICA. Senator, we're confident that we have the posture in place to defend the United States against the threat and to defend our forces forward deployed and our friends and allies in the region. There is no 100 percent missile shield, so there's no guarantees. But we have an appropriate posture in place for the threat that we face.

Senator DONNELLY. With U.N. sanctions that have been in place on North Korea, do you see that North Korea continues to make gains in their missile systems, improvements in the systems they're developing? With the sanctions in place, how are those improvements able to occur? That would be for Secretary Creedon.

Ms. CREEDON. I'll jump into this fray. What do we worry about most? I think from a policy perspective most we worry about just the unknowns and the uncertainty. I think, as you've heard others say, our lack of intelligence with respect to activities, plans, intents for North Korea is just about as poor as it exists for anywhere else in the world. We are very much looking at ways to improve this intelligence, but it's a very difficult environment. So that's probably the thing that makes for a significant amount of worry, is we just don't know what they're going to do next. It's just that uncertainty.

Senator DONNELLY. This is something that has just come up in the last day or so, but it has been talked about that Russia may send S–300 missile systems to Syria. What do you know about those systems? How effective are they? Because we are in a process of trying to come up with appropriate decisions regarding Syria and this certainly only complicates things even further.

Vice Admiral, I would like to thank you also for coming by the other day. We appreciate it very much.

Admiral SYRING. Thank you, sir.

I would recommend, sir, that on that subject that we go to a closed session.

Senator DONNELLY. Okay, very good.

Ms. CREEDON. There's a context for that that really needs to be talked about in a different setting.

Senator DONNELLY. Understood.

With the east coast ballistic missile defense system, can you give us an update on the status of site selection for that, and what are the factors that are being considered in regards to that?

Admiral SYRING. Yes, sir, I'd be happy to take that. The effort has started in terms of defining criteria and evaluating potential sites. There's literally hundreds of sites that are under consideration. Some of the criteria that will be finalized and approved in terms of the final selection criteria will include booster drop zones, proximity to population centers. A big part of it is going to be the operational efficacy of the site and how that plays into where the geographic location is.

But I would say that there are 10 or 12 major factors, sir, that will play into that. The process has started. It will go through a weaning process, an approval process, through the summer to come out with a briefing to the leadership and recommendation on what the few sites are for possible inclusion.

Senator DONNELLY. Is there going to be one site or will there be multiple sites that we're choosing?

Admiral SYRING. There'll be a few. I say three today, sir. Then as you know, the EIS after that forces us to look at several sites, not just one. There have to be other sites that are looked at for environmental impact as well.

Senator DONNELLY. Okay. With the MDA, how are things going in developing research relationships with various universities? I know in my home State, Purdue is looking to develop a relationship and I was just wondering where we are in that process and how that moves forward.

Admiral SYRING. We're doing very well with our relationships with the universities, and I see that continuing in this budget request, sir. I've actually met with Governor Daniels once already and received a series of briefings for a day at Purdue University, and I would say those discussions and future teaming opportunities continue.

Senator DONNELLY. I would like to close by saying, Vice Admiral and Secretary Creedon, we are very proud that you call Indiana your home State. Thank you very much.

Thank you, Mr. Chairman.

Senator UDALL. Thank you, Senator Donnelly.

Senator Fischer.

Senator FISCHER. Thank you, Mr. Chairman. I would once again like to thank the panel for being here today.

Admiral, I have a few questions for you. General Jacoby has stated that the third missile defense site would provide better weapons access, increased GBI inventory, and additional battlespace, in his words, to more optimize our defense against future threats from Iran and North Korea. Could you elaborate on this? Tell me why it's a good thing and what are we talking about when we talk about weapons access and battlespace?

Admiral SYRING. Senator, I'll keep it very short and simple, and my colleague to my right may wish to jump in from a warfighter's standpoint. Battlespace, obviously capacity is known in terms of more interceptors, is capacity. Battlespace means reaction time in terms of the amount of time that we have and the proximity that we have of putting an interceptor in flight to intercepting a threat missile.

General FORMICA. Senator, that's exactly the same answer that I would give. Battlespace is the increased decision time because you'd have a shorter time of flight for your interceptors from a site further to the east than you would from Fort Greely.

Senator FISCHER. Would you then agree with the General's assessment on that third site, that it would provide better weapons access, increased GBI inventory, and additional battlespace?

Admiral SYRING. Yes, ma'am.

General FORMICA. Yes, Senator. Certainly it brings increased capacity and increased capability than we have at Fort Greely. The tradeoff, of course, is going to be the investment in infrastructure facilities, force structure, and manpower.

Senator FISCHER. In last year's defense authorization bill, Congress required DOD to conduct the EIS to evaluate three sites in

the United States. Can you tell me what the status of that is and when it will be complete?

Admiral SYRING. Yes, ma'am. The siting studies have started and we will meet the deadline of December 31 of this calendar year with recommendations.

General FORMICA. Senator, if I may just add, the process that MDA is going through is inclusive and that the warfighting community is part of that process, and operational considerations will be factored into their site selection recommendations.

Senator FISCHER. Is part of that process to provide an additional missile defense site?

Admiral SYRING. Part of the process will be the evaluation of a potential site, and then in conjunction with that, the development of a contingency plan on what a third site would bring to the defense of the United States.

I would just add, Senator, if I can, that there will be other factors that I look at with the combatant commanders in terms of formulation of my recommendation to them for a requirement for the east coast site or a continental United States site. There'll be other factors that I look at, along with the warfighter, in terms of other parts of what I call the kill chain that are equally important to interceptors and not just interceptors, in terms of us staying ahead of the threat.

Senator FISCHER. Can you share with us what some of those other factors would be?

Admiral SYRING. Yes, ma'am. The assessment capability in terms of discrimination and the warfighter being able to do a proper kill assessment once interceptors are shot is critically important today and in the future as we deal with more complex debris scenes with the more complex threat missiles that we envision coming. This sensor capability and discrimination capability cannot be understated in terms of the benefit that it will bring the warfighter, in my mind as the material developer the absolutely needed capabilities. But again, that requirement will be set by the combatant commanders, informed by our analysis.

Senator FISCHER. General, did you have anything to add on that?

General FORMICA. No, Senator. I think he covered it very well.

Senator FISCHER. Is there funding in this year's budget for this and for the out years for this third site?

Admiral SYRING. No, ma'am. There's funding that I've taken out of the MDA budget to do the current study work that's ongoing and that will cover within the MDA budget the EIS work that needs to start next year if so directed. But there is no funding for anything beyond that.

Senator FISCHER. If funding were available, how long would it take to build the site?

Admiral SYRING. Ma'am, depending on the assumptions and how fast the EIS goes, 5 to 7 years.

Senator FISCHER. What's the average length of time for an EIS?

Admiral SYRING. The metric I use is 18 to 24 months.

Senator FISCHER. Would such a site benefit from the deployment of an X-band radar on the east coast?

Admiral SYRING. Yes, ma'am. Back to my point on sensoring and assessment and discrimination capability, an X-band radar, frank-

ly, anywhere east would greatly benefit the threat that I, and we in the agency, see coming, and certainly that would be part of it.

Senator FISCHER. How long do you anticipate that we have to address the threat that you see coming?

Admiral SYRING. I'll just repeat the intelligence assessment. Iran may be able to flight test an ICBM by 2015, and then anything beyond that I would like to keep into a closed session.

Senator FISCHER. Thank you, sir.

Also, the MDA is now focusing on that common kill vehicle, the technology for that; is that correct?

Admiral SYRING. Yes, ma'am. It's a technology program in this year's budget.

Senator FISCHER. That's for GBI?

Admiral SYRING. Yes, ma'am, for the exoatmospheric kill vehicle (EKV).

Senator FISCHER. What's your timeline for providing that?

Admiral SYRING. With this year's budget we will start that concept in terms of what components of the current EKV potentially need to be upgraded now. It's 1990s technology and certainly there's components in there that, given the opportunity to redesign or replace, we would do now in terms of future procurement of GBIs. Then look for commonality and goodness between that kill vehicle and the Aegis kinetic warhead, which has performed just magnificently in the past few tests.

Senator FISCHER. As we look at these timelines that we've been talking about, does that keep us ahead of the growing threat?

Admiral SYRING. Yes, ma'am.

Senator FISCHER. Thank you, sir.

Senator UDALL. Thank you, Senator Fischer.

Senator King.

Senator KING. Thank you, Mr. Chairman.

I'm the newest member of this subcommittee, so I'm going to ask some very basic questions. If a missile was fired from North Korea tomorrow to Hawaii, assuming they had the capability to do that, could we knock it down?

General FORMICA. We maintain a posture to defend the continental United States and Hawaii. We have the capabilities in place to do that. But the degree of assurance varies depending on how our posture is actually situated.

Senator KING. The reason I ask that question is that we hear about tests that don't work, and yet on the other hand I hear we can protect the Homeland, and I'm trying to square those two things. Do we have tests of the facilities that are deployed now that indicate there's a high probability? Is it 60, 70, 80, 90, 99 percent? How good is this system?

Admiral SYRING. Let me take that and then maybe, sir, I'll cede some time to Dr. Gilmore. The systems we have today work, and I'll keep it that simple. The older systems, which we call the CE–1 interceptors, have been successfully flight tested three out of three times.

The problem that we've had recently is with the newer interceptor and those failures, both occurring in 2010. That's the flight test that I spoke about in terms of the January fix was flown in

a non-intercept flight and then we'll fly later this year in an intercept flight to validate the performance of the new kill vehicle.

But all of those missiles remain at the ready for the warfighter. So, coupled with the available inventory and the warfighter shot doctrine, we are protected today, sir.

Senator KING. Can you put a percentage on it?

Admiral SYRING. No, sir, not in this forum.

Senator KING. I understand the President's budget includes an increase for the Aegis program. How does Aegis fit into the strategy?

Admiral SYRING. Sir, Aegis is a big part of our regional defense posture today in Europe and over near Japan in terms of ships that are either forward deployed or will be forward deployed in terms of us taking ships to Rota. There's a very methodical EPAA that has been in large part based on Aegis capability improvements over the next 5 years between now and 2018. We've fielded the first phase already in 2011, and then there'll be incremental improvements to the Aegis fleet and missiles that come between now and 2018, first to Romania and then to Poland.

Senator KING. Aegis is part of the long-term strategy, I presume?

Admiral SYRING. Absolutely, sir.

Senator KING. By the way, on the question of percentages, you said it would be not in this forum. I would like to get that answer in a forum that's appropriate.

Admiral SYRING. Yes, sir, we will do that.

Senator KING. Thank you.

Madam Secretary, on the east coast site just a couple of questions. You mentioned that there are—I think both you and the Admiral mentioned there are going to be three sites, EISs. When are we likely to get those designations? When will there be an announcement on those three?

Admiral SYRING. Sir, once we have approval from DOD, towards the end of the year, to meet the December 31 deadline.

Senator KING. So that won't be until much later?

Admiral SYRING. Yes, sir.

Senator KING. Tell me what would one of those facilities entail if fully built? What does it look like? How many people are there and what's the magnitude of the installation?

General FORMICA. Sir, probably the best way to answer that question is to describe what we have at Fort Greely, AK, which was at the time that it was designated an existing Army facility that as a result of base realignment and closure had been essentially in a reduced operational status. So today you have a missile defense complex that's got three missile defense fields, essentially with the silos built and the GBIs provided by the MDA. You have the infrastructure on that installation to provide for the housing and work areas for the organization, the unit that is there to provide the operational capability that would actually release the interceptors should a decision be made to do so.

So you have many of the standard things that you'd find on an installation. You have barracks, you have the unit office space. This is outside the missile defense complex. You have the soldiers that not only man the fire direction crews that would release the

interceptors, but you have a company that provides security to the missile defense complex.

Then the kinds of support infrastructure that you would have, anything in running a typical garrison, from PXs and commissaries to other garrison facilities.

Senator KING. So based on Fort Greely, can you give me a ball park figure of this total, the total population of this facility, including the support and infrastructure and guards and all of that?

General FORMICA. We maintain—the battalion that's there is about 240, 250 Army National Guard soldiers, and I don't know the exact number of civilians, but I would guess it's at least that many. So I would say somewhere around 400 or 500. I'll get the exact number for you, Senator, and provide it to you for the record. But it's probably about 500 or so total, soldiers and civilians and contractors, that are involved in providing the capability at the missile defense complex and the infrastructure that supports it.

[The information referred to follows:]

There are approximately 1,000 personnel on Fort Greely, AK. Of this number, about 200 are military, 400 are civilians, and the remaining 400 personnel are contractors supporting the Fort Greely Garrison and the missile defense mission.

Senator KING. One of the issues that I've been concerned about as I've been in these hearings is a growing submarine capability. It seems like everybody wants to have a submarine and a lot of countries do. I take it that this shield that we are constructing and have constructed would be effective against a submarine-launched missile, which could be much closer. How do we deal with a submarine-launched missile that would be a couple of hundred miles offshore? Is that a different issue? Again, it gets back to this east coast issue. I can't see how we could get a shield missile, an interceptor, from Colorado or Alaska to protect the east coast against a missile that's launched from within 500 miles of the coast.

Talk to me about submarines.

General FORMICA. Actually, Senator, my assessment is that the ballistic missile defense system that's in place is designed against an ICBM, a limited ICBM threat from North Korea and Iran.

Senator KING. Not submarine-launched missiles?

General FORMICA. Not submarine-launched.

Senator KING. What is our strategy with regard to submarine-launched missiles?

General FORMICA. I'd have to take that for the record. We don't have a strategy. The NORTHCOM commander has obviously identified that kind of threat as a concern and that is an area that he is concerned about.

[The information referred to follows:]

The Department—to include Office of the Secretary of Defense for Policy, the Missile Defense Agency, and me—will provide you a classified Missile Defense briefing on June 3, 2013. In it, we will provide you additional information regarding the ballistic missile defense system and submarine capability.

Senator KING. Madam Secretary?

Ms. CREEDON. I just want to jump in for a minute. I think we probably should get you—this is a very complicated topic, to say the least.

Senator KING. I'm figuring that out.

Ms. CREEDON. It isn't just ICBMs. It's also cruise missiles. But why don't we make the offer to get you a briefing on some of the issues and complexities associated with a submarine threat off the coast, either coast of the United States.

Senator KING. Absolutely. I'm just trying to think like the enemy here. If you guys can stop intercontinentals, then I'm going to bring them in in another way. Of course we can have a whole different discussion about one that comes in in a suitcase into New York harbor.

Okay. I think that's it, Mr. Chairman. Thank you.

Senator UDALL. Thank you, Senator King.

Let me turn to the entire panel. I will recognize myself for the second round here. We've talked about this. In December 2010, the ground-based midcourse defense system had a failed flight test, and MDA has been working ever since to fix the problem with the Capability Enhancement-2 kill vehicle, known as the CE–2. On March 15 when the Secretary of Defense announced plans to deploy 14 additional GBIs in Alaska, he said that before deploying those 14 additional GBIs we would test and demonstrate the system and have confidence that it will work as intended.

Do you all agree that it's essential that before we deploy these 14 additional GBIs that we need to test the system with the corrected CE–2 kill vehicle in a realistic intercept test and demonstrate that it will work as intended?

Why don't I just go across and ask each one of you to weigh in. If it's a yes or no, that's fine, or if you want to elaborate. Madam Secretary?

Ms. CREEDON. Given the nature of the relationship between the testing and the adequacy of testing, I think this is really one for Dr. Gilmore.

Senator UDALL. Okay. Dr. Gilmore?

Dr. GILMORE. My understanding of the Secretary's statement is that he wanted confidence that the problem that had caused the interceptor failure in December 2010, the root cause of that problem had been identified and we have demonstrated, we will have demonstrated, that it's been fixed. The root cause has been identified. The flight test that was the non-intercept flight test that was done not too long ago demonstrated that some design changes to the kill vehicle certainly have the potential to correct that problem.

The reason I say that—and I choose my words carefully—is that as the operational test fellow I don't—I won't say that we've successfully demonstrated the problem is fixed until we've actually done an intercept test flying under the same conditions that were flown in December 2010. My understanding is that, although it's not in the integrated master test plan that was submitted earlier this year, that we will do that intercept test in all likelihood in early fiscal year 2014.

So at that point, if that intercept test is successful, a repeat of the previous failed intercept, then in my view we would have confidence that the problem has actually been successfully fixed.

Senator UDALL. If others have comments, I'd love to hear them. Let me just remind the witnesses that the question is whether they agree we need to test it. We can talk about the other questions that would arise, but that was really what I was trying to get at.

Ms. CREEDON. Sir, on that point, I would say absolutely. In fact, we stated in the context of the announcement on March 15, and the Secretary has reiterated, that DOD is very much in the fly-before-you-buy construct.

Senator UDALL. Fly-before-you-buy.

Ms. CREEDON. Exactly. We're going to fly-before-we-buy.

Senator UDALL. Okay.

Ms. CREEDON. So we are not going to buy these missiles until we've demonstrated that they are, in fact, fixed and have had, as Dr. Gilmore said, a successful intercept test.

Senator UDALL. Thank you.

General?

General FORMICA. Mr. Chairman, I would just add from an operator's perspective that we want to retain the confidence in the CE–1s and we want to gain confidence in the CE–2s, so that we can continue to have confidence in the overall GBI fleet and the ballistic missile defense system. To that end, we support the MDA's intercept plan to test the GBI, CE–1, with an intercept later this month, so that we can retain confidence in it, and to test the CE–2s with an intercept so that we can gain confidence in that system.

Senator UDALL. Admiral Syring?

Admiral SYRING. The direct answer, sir, is yes, I agree.

Senator UDALL. Ms. Chaplain?

Ms. CHAPLAIN. Absolutely necessary in our opinion.

Senator UDALL. It's good to have the GAO in the house.

Let me turn to General Formica. At our space hearing in April, you testified that expert participants at a recent missile defense symposium agreed widely on the need for improved offense-defense integration. I believe that's also one of the conclusions of the 2012 global ballistic missile defense assessment that you led.

I gather that means we should not think about our missile defense capabilities only in terms of what our missile defenses can defend against, but also what our offensive military capabilities can provide to both deter and defeat missile threats. Can you explain the importance of offense-defense integration in terms of how we think about missile defense? For example, would offensive capabilities mean we don't rely only on defensive systems, which would reduce our need for defensive interceptors?

General FORMICA. Thank you, Chairman Udall. We believe and would advocate strongly for offense-defense integration for missile defense. We'll never have sufficient capacity in our missile defenses alone to meet all of the threats or potential threats that are out there. So offense-defense integration is important. Attack operations by our doctrine is an integral part of missile defense. While it won't enable us to reduce the missile defense capabilities that we have, it will augment it and help make up for the capability gap that we have, the overmatch, by not having the capacity to respond to all of the threats that are out there.

I think we saw even just most recently in this recent provocation by the North Koreans that the non-lethal application of offensive capability, in conjunction with missile defense, demonstrates the ability of the United States to both deter a threat and assure our allies, and to me validated the importance of both offensive and defensive integration.

Senator UDALL. We're going to follow up more on that, obviously. Let me ask a question of all of you. You know better than most that missile defenses are highly complex and expensive, and we want to ensure that they're going to work as they're intended to do so if we ever need to defeat a missile threat. You also know we need to improve them over time.

In your view, what would be the most cost-effective step we should be taking under current fiscal conditions to make sure that our missile defense systems will work as intended and to improve those systems over time? Secretary Creedon, maybe I could start with you.

Ms. CREEDON. I would say initially we need to carry on with the test program to ensure that the improvements to the CE–2 work, that we need to verify that the CE–1 continues to work, and that we begin to look at how we can improve the capabilities of the system for the challenges that we know are coming in the future, so how we address larger raid size, how we address discrimination capabilities. Those would be the categories of work that I think we really need to rely on, because if we can improve some of those then we can also improve the capability of an individual missile, so we can get more with less if we can do some of that work.

Senator UDALL. Dr. Gilmore?

Dr. GILMORE. I'll give you a not surprising answer, given my responsibilities. We need to continue to test. Now, we are never going to with live flight tests obtain a statistically significant set of data on performance, from just live flight tests. But those live flight tests are critical because they provide the data that we can use, that we must use, to rigorously accredit our modeling and simulation capabilities.

So if you have rigorously accredited modeling and simulation capabilities that you can run and they replicate the results that you get in live fire testing, then those modeling and simulation capabilities are what give you the statistically significant set of data on performance of the system.

So if you're asking me what I think is important, it's continue to test, but also allocate the resources needed to develop and put in place the modeling and simulation capability so that it can be rigorously accredited. Then I would also agree with Secretary Creedon regarding discrimination. If we can't discriminate what the real threatening objects are, it doesn't matter how many GBIs we have; we won't be able to hit what needs to be hit. As the National Research Council and many others have pointed out, discrimination is a tough problem. I know that Admiral Syring is working very hard on it and agrees with that view. So I would emphasize working on better ways to discriminate.

Senator UDALL. General Formica?

General FORMICA. Senator, Mr. Chairman, I would reiterate much of what has already been said. We certainly support not only a rigorous test program to retain and regain confidence in the system, but also an exercise program, because in the conduct of tests we have the opportunity as warfighters to validate our concepts of operations and for the users to actually get confident in the systems that have been developed for them and to practice tactics, techniques, and procedures.

To continue to improve the capabilities of the GBIs and to improve and increase our interceptor capacity, as was already said, we would invest, want to invest in sensor capability to get after early tracking and improved discrimination, and to continue the investment in the command and control structures that knit that architecture together, so that we can take better advantage of the various sensors that are already out there and use them for missile defense capability.

Senator UDALL. Admiral Syring?

Admiral SYRING. Mr. Chairman, I'll just summarize three areas that I see. One, our steadfast commitment to the test program. I come from a test background. Since I've been the Director, in calendar year 2013 we'll have conducted three GBI flight tests: a control test, vehicle flight test in January, with two intercept tests this year. I have in the budget another intercept test next year, in fiscal year 2014. I think the drumbeat specifically on GBI testing is vitally important and I intend to continue that, in addition to testing THAAD and Aegis systems regularly, as we do.

Second, to execute the new strategy, because the new strategy is critical to the capacity for the warfighter. Underpinning that is the successful execution of the test program.

So those two are at the top, and then also equally important would be sensors and discrimination. When I say sensors and discrimination, sir, I mean not just radars; I mean radar and infrared and lasers and the important work that we're doing in directed energy at the technology level and the importance of that to keep ahead of the threat. I see that as vitally important.

All three together are my focus as the Director.

Senator UDALL. Ms. Chaplain?

Ms. CHAPLAIN. From a "work as intended" perspective, we would agree with everything that's been said. The modeling and simulation issue in particular doesn't get enough attention that it deserves. The progress there has not been as good as we would like it, and MDA is renewing its efforts into restructuring or redoing that program and we're hopeful that will work out better.

But I would add in terms of that perspective the need to really fly before you buy. Really, you follow approaches that aren't really overlapping production and testing, because that's been at the root of a lot of problems that we see today.

From a cost-effective perspective, I would emphasize two sides: before you buy, really analyzing all the alternatives before you and what is the most cost-effective way to pursue a capability; and then on the back end, the reporting about costs so that Congress can prioritize continually. The reporting on costs right now is not where it needs to be. It's not complete. You can't compare from year to year, and that's very important just from a cost-effective perspective.

Senator UDALL. Thank you.

Thanks for the committee's indulgence. I took a few more minutes, but this was, I think, a question worth hearing.

Senator Fischer.

Senator FISCHER. Thank you, Mr. Chairman.

Admiral, if we could just follow up with one last question on that common kill vehicle. Are you thinking of placing more than one kill vehicle atop the GBI?

Admiral SYRING. Ma'am, that would be down the road once we have flushed out the potential for scaling the technologies that we're going to work on as part of the advanced technology effort this year. But certainly it would be a consideration down the road.

Senator FISCHER. Thank you.

Madam Secretary, moving on to precision tracking space system. Why did DOD terminate that system?

Ms. CREEDON. I have to say this was a very difficult decision for a number of reasons, not the least of which is the issue of dealing with larger raid sizes. Part of the problem was there is a recognition that we need something. At the end of the day, the Department concluded that this particular something was probably not the right thing, that it was probably too high risk and it was probably not quite the right approach.

So, given where we were in the program, the decision was made to terminate that program. Again, part of the work that needs to be done over the course of the next couple years is really to look at what a sensor architecture looks like, both ground- and space-based sensors, and really come to grips with what is the right architecture for that. So it was a very difficult decision because we know we need something along those lines, but Precision Tracking Space System probably wasn't the right thing.

Senator FISCHER. But it was put in place for a reason, correct? To identify those decoys. So what are we looking at to be able to accomplish that mission now?

Ms. CREEDON. That's actually one of the things that has to go over the course of the next year or so, is really look at what does a reasonable sensor architecture look like. So part of the issue is having some more radars on the ground. We'll continue to look at the space-based. But frankly, I think that one of the things the GAO has recently raised in some of its reports is this whole idea of doing sufficient analysis of alternatives. This is probably one of those areas where we could have benefited from a little bit more on the analysis of alternative work.

Senator FISCHER. Do we need to have a space-based sensor system out there?

Ms. CREEDON. My understanding is yes, we do, and I will turn it over to Admiral Syring to add some more. But based on some of his recent tests, I think the answer is yes.

Senator FISCHER. Admiral?

Admiral SYRING. Yes, ma'am, absolutely. I've been clear that we need that capability. We need to have that capability in space, as I see the threat in terms of the required discrimination capability for the future. It doesn't have to be an MDA-developed system and I think that you'll see us explore those alternatives and those partnerships with other organizations, like the Air Force Space Command.

Senator FISCHER. So your recommendation is we don't just rely on a ground-based? We also need the space-based, correct?

Admiral SYRING. Ma'am, we need ground-based for radar and we need infrared capability above the clouds, yes, ma'am.

Senator FISCHER. Thank you.

Also, Admiral, now that we're seeing the termination of the 2B program, do you know what the plans are for the future SM–3 missile deployment?

Admiral SYRING. Yes, ma'am——

Senator FISCHER. After 2018?

Admiral SYRING. Ma'am, the 2A missile will be fielded in 2018. I think what I view will happen as part of the common kill vehicle program is us looking at technologies across the kill vehicle for Aegis, the SM–3, and the kill vehicle for the GBI, in addition to other improvements that could be made in, for example, propulsion stacks or attitude control systems, in terms of proving that we can and we have in the past upgraded the SM–3 from the 1A to the 1B, and I would imagine that as the threat continues to evolve that we'll look at upgrades to the 2A as required.

Senator FISCHER. Do you think it's possible for the Standard Missile to play a role in homeland defense, then?

Admiral SYRING. Ma'am, as you saw with the—and I'll let General Formica jump in here—I'm bordering on classification, so I need to be very careful. Maybe that would be a subject in a closed forum in terms of what it can and can't do.

Senator FISCHER. Thank you. Thank you very much.

Thank you, Mr. Chairman.

Senator UDALL. Thank you, Senator Fischer. It sounds like we will arrange for a classified briefing, I think, per Senator King's interest.

Senator King, you're recognized.

Senator KING. I just want to follow up on a question the chairman asked about sequester. We all know the effects of the sequester in 2013. It's important to realize, however, that the sequester is a 10-year deal. It's in the law, and if nothing happens, which seems to be the case around here, it will continue.

A year ago, everybody said it was impossible, it would never be allowed to come into effect, and now here we are. So I don't think we can discount the likelihood that it won't continue.

My question is very clear. General, I'll start with you. Would a continuation of the sequester for 1, 2, 3, or 4 more years compromise, significantly compromise, your ability through this program to defend the Homeland?

General FORMICA. Senator, obviously we're all concerned about the impacts of sequestration on the ability to provide capabilities. My biggest concern at this point is the impact it will have on future training and readiness as we balance training and readiness against modernization. So, left unchecked and without the appropriate prioritization, then it will have an effect on our ability to provide missile defense.

As I testified to this committee a couple of weeks ago, the other impact, both more immediate and into next year and beyond, I'm also concerned at the impact that sequestration is having on our professional civilian workforce. The threat of a furlough and the impact that a furlough might have not only on them, personal hardships that they would endure, but on our ability to do the mission; the hiring freeze and the challenges that that poses, and the other impact on civilian professional development.

So I am also concerned about that impact of sequestration as well.

Senator KING. I presume there would also be an effect—we were talking about testing and development. I presume there would be an effect across the board. Admiral?

Admiral SYRING. I would echo the General's comments, sir. As I said earlier in the hearing, the cut that I took in 2013 had impact and the cut if the law is not changed in 2014 will have equal or more impact as well. I see the demand for missile defense from the combatant commanders as increasing in terms of capacity required and I worry about us being able to meet that demand signal, given continued budget reductions.

Senator KING. One of the concerns that's been raised in other hearings of this committee is that there's a lag effect, that the negative effects will take place in the next 2 or 3 years, but it would be years later, would still be an effect, because of loss of talent, for example, and loss of or slowing down of development, R&D, and those kinds of things.

General FORMICA. Yes, Senator. Just as an example, for this year most of the soldiers, sailors, airmen, and marines that are manning the missile defense systems are trained and on station. As we look through the impact of sequestration on our ability to train those forces, that becomes a problem in succeeding years.

So right now, in terms of trained and ready forces in SMDC, for instance, I'm confident that we have them, we have them in place in fiscal year 2013. I'm concerned about the impact on the reduction in training in fiscal year 2014 and beyond.

The other thing I didn't talk about when I talked about training is we're also scaling back on exercises. As we conduct fewer exercises and less robust exercises, not just the test program but the exercise program, then those are the opportunities for us to train our battle staffs and those that would make decisions so that we can execute the missile defense system.

Senator KING. So training and exercises are being curtailed now, is that correct?

General FORMICA. That's correct, Senator.

Senator KING. Thank you, Mr. Chairman.

Senator UDALL. General Formica, let me turn to a topic I raised a little bit earlier, which is the annual military assessment of our global missile defense capabilities that you lead. You look both at Homeland defense capabilities and regional missile defense capabilities, as I understand it, in regards to the combat commanders'—I should say, combatant commanders' needs. Then you assess risk in terms of threats and capabilities.

In the most recent assessment, what were the overall risk assessments for Homeland defense and for regional defense capabilities? Was one considered higher risk than the other? Then as a follow-on, did the assessment suggest that our combatant commanders have a need for increased regional missile defense capabilities relative to the regional missile threats they face today?

General FORMICA. Mr. Chairman, thank you for the question. Yes, we conduct a global ballistic missile defense assessment annually that informs STRATCOM's process to develop a prioritized capability list that the MDA and others respond to. When we conduct

that assessment, last year's for instance, we assessed—and again, the specific assessments for each region would obviously be classified. But the assessment for the Homeland, which clearly remains our number one priority, is at a lower risk than the assessment for the regions in terms of their ability to provide for missile defense for their forward-deployed forces there.

The trends generally tend to go back to some of the things I've mentioned previously in my testimony today: capacity of interceptors, the need for adequate sensor coverage so we can take advantage of the sensors that are out there. It reinforced the need for offense-defense integration to reduce the dependence strictly on missile defense, but that comes with an increased requirement for intelligence, surveillance, and reconnaissance. Also to continue to improve our integration of the missile defense capabilities of our allies and coalition partners.

Senator UDALL. I'm tempted to ask you about Iron Dome, but I don't know if that's a question that's appropriate in this setting. But I would acknowledge that, having visited both a battery and the command headquarters in Israel last May, that's a real success story. Those of us who watched this, we understand that it gave the Israeli Government flexibility that it wouldn't have had otherwise perhaps, and we might have seen the Israel Defense Forces (IDF) go into Gaza because they would have had no other alternative.

General FORMICA. Mr. Chairman, I would say it's safe to that Iron Dome is a very successful missile defense system. Again, there's no shield that completely protects us, but it does provide effective missile defenses and the IDF have demonstrated that.

Senator UDALL. Dr. Gilmore, let me turn back to you. You're the independent source of oversight of operational test and evaluation programs, as we know. That includes missile defense testing, and you've reviewed and approved the MDA integrated master test plan. Do you believe that test plan is robust, rigorous, and properly structured to provide the data we need to assess the performance of our missile defense systems in an orderly and disciplined fashion?

Then a second question: Do you believe the planned pace of MDA testing is appropriate and sufficient, given the need to learn from previous test results and other real-world constraints?

Dr. GILMORE. My answer to both those questions is yes. I'll elaborate a little bit on the second one.

Senator UDALL. Sure.

Dr. GILMORE. Historically over the last decade, the pace of ground-based missile defense testing, which I think is the subject of some discussion and controversy, is about 1.3 intercept tests per year. The pace of flight testing earlier in the decade was a little higher. It was about 1.7 intercept tests per year. As Admiral Syring just mentioned in an answer not too long ago, during the course of the next year beginning now we may actually—including the test that we did not too long ago—conduct three tests for ground-based missile defense: the non-intercept test, the test of the Capability Enhancement 1 kill vehicle coming up within a month, and then the test of the Capability Enhancement 2 kill vehicle, probably early in fiscal year 2014.

That's an outlier and there are some reasons that that more rapid pace of testing that I've characterized as an outlier is possible. First of all, the non-intercept test did not involve a target. That made the planning for that test simpler to do. The CE–1 test later, within a month, and the CE–2 test at the beginning of fiscal year 2014 will be tests that are flown using the same trajectories and targets that were already planned for and analyzed for what was called FTG, Flight Test Global Missile Defense, 06 and 06A, both of which failed, for different reasons, 2 and 3 years ago.

So because we didn't have the target in the case of the test that was conducted not too long ago and because of the fact that we're basically using the analysis and the plans that were developed previously for the upcoming two intercept tests, that makes it possible—that's a large part of the reason that makes it possible to conduct those three tests and to shorten the amount of time that's needed for planning for the test, executing the test.

It won't shorten much the amount of time that's needed to analyze the data. What we don't want to do in this testing is to cause the period during which the data from a test is analyzed so that we can learn, understand and learn to overlap with the period that's used for planning the next test, because if we do that then we're not going to be able to learn.

Now, I'm not going to sit here and deny that the existing process couldn't be accelerated somewhat. But I would say this: planning for these tests, and in particular analyzing the data from the tests, is not like building automobiles. I don't mean that to be pejorative to automobile manufacturers, but automobile manufacturers can double their output by building a new plant and hiring a bunch of new workers. That's not the case when it comes to analyzing these test results. Could additional personnel help somewhat? Yes, they could. But it's the kind of activity that reaches a point of diminishing returns in my experience. For example, you can't half the time it takes to analyze data by hiring twice the number of engineers and analysts.

So again I'll reiterate. My answer to both questions is yes, and I support a deliberate pace that's not any slower than it has to be, but allows the time that's needed to rigorously plan and rigorously analyze the test results. Otherwise we won't be learning and the point of the tests will be lost.

Senator UDALL. Thank you for that. I want to turn to Senator Fischer.

I'm trying to think of something disparaging to say about our British cousins, because I think the uproar out in the hall is because Prince Harry is in the Senate, I should say, not in the House. He's in the Senate. Initially I thought it was because—and this is a very important hearing—that they were waiting for the results of our hearing. [Laughter.]

Let me turn to Senator Fischer.

Senator FISCHER. Thank you, Mr. Chairman. Yes, I said to you earlier, I think Prince Harry's in the house. But you corrected that. He's in the Senate. [Laughter.]

If I could just ask a couple more questions here on a different topic. On Tuesday before this subcommittee, we had the national lab people come and it was a very informative discussion that we

had on that. I know in the past, Admiral, that you've worked with I believe it's the Lawrence Livermore Lab. Do you still work with our national labs?

Admiral SYRING. Yes, ma'am, very closely. Lawrence Livermore in particular is with the diode pumped alkali laser system. That is a big effort of ours and theirs for the future. So yes, ma'am.

Senator FISCHER. Are you worried about what's going to happen when we see funding cut and the concerns that the labs now have with their funding and not being able to do testing, how that will affect your program as well?

Admiral SYRING. Yes, ma'am, I am. I watched that very closely as to took the sequestration cuts.

Senator FISCHER. Madam Secretary, do you have anything to add on that point?

Ms. CREEDON. Other than this really is a significant problem. The labs, particularly the three labs that you had here before, truly are crown jewels for this country, and they do a wide variety of things. I know that they really are mostly billed as weapons labs, but each of them does much, much, much more than nuclear weapons. In many respects, a lot of what DOD has across the board from its various weapons systems and capabilities, many of that—many of those capabilities can find their way back in some form or fashion to the labs.

They also are very much involved in the whole nonproliferation effort that DOD has, that's obviously not related to this hearing, but is under my office. They do a tremendous amount of work in detection technologies. They support our intelligence-gathering function and a wide variety of things. So they have a very wide and very important slate of activities. I do worry that we make sure we pay attention to all of that and keep them healthy.

Senator FISCHER. Thank you very much.

I would like to thank all of the panel for being here today. I appreciate your views and your input on this very important subject.

Thank you, Mr. Chairman.

Senator UDALL. Thank you, Senator Fischer.

I thought I'd ask one last question of Ms. Chaplain and then we'll bring the hearing to a close. What I wanted to ask is, of course, the GAO has provided numerous suggestions over the years for improving missile defense acquisitions. You've had some additional recommendations this year. There seems to be a tension between the sense of urgency and demand for missile defense capabilities, particularly to address combatant commander needs for existing regional missile threats, which I referenced earlier, and the acquisition practices you recommend. Given that tension, can you tell us what acquisition improvements you believe are achievable in the near-term to meet the needs of our warfighters, but also ensure that the systems we provide work well and are affordable? Easy question, I know.

Ms. CHAPLAIN. I agree that there is tension, because there's a lot of schedule pressure on MDA to deliver systems within presidential set timeframes. There are concerns about the industrial base and the need to keep it stabilized and productive over time.

We, on the other hand, do recommend strategies that are knowledge-based. We talk about concurrency, being more sequential in

terms of the development process. But we are not recommending 100 percent absolutely conservative strategies, given the mission that missile defense has. We do believe the overlap in some activities, like production and testing, has just been way too significant in some cases and caused just way too many problems in terms of retrofitting, that end up ultimately disrupting the industrial base because you're turning them on and off and on and off, and it's just really hard to get people on and off and on and off, and it creates more problems.

For older programs, it's do what you can with what you have in terms of reducing that risk. Where we really like to see attention placed is on the newer programs and structuring them in a way—now that you have an initial capability in place, you have more the ability to follow best practices and more knowledge-based acquisitions.

So where we've seen new programs take higher-risk approaches, they're setting their commitment dates where all the acquisition activities ramp up before they really understand the requirements and how they match their resources, we're really encouraging them to restructure those milestones in a way that will benefit them in the long run. To its credit, Missile Defense has done that on some key programs in recent years.

So we're hoping, with the focus on recent programs, we can have better execution paths going forward.

Senator UDALL. Thank you for those thoughtful recommendations and insights.

I'm going to bring the hearing to a close. I think I speak for Senator Fischer when I say I had a chance to look at each and every one of your biographies and it makes me really proud and impressed, and I'm in awe of each and every one of your commitments to public service, as well as your educational backgrounds. You give me a lot of comfort that you're on the mission, that you're serving our country, and that you've dedicated yourselves to causes greater than your own self-interest.

So thank you for being here.

General Formica, we wish you all the best. I don't think you're really going to retire, knowing you. I look forward to the next mountain you're going to climb.

With that, we'll have additional questions for the record and we'll ask that you provide prompt responses to those questions. We are in the process of working up our subcommittee mark here soon because we want to get the National Defense Authorization Act underway. So I know you'll do so.

With that, this hearing is adjourned.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR JEFF SESSIONS

EAST COAST MISSILE DEFENSE SITE

1. Senator SESSIONS. Secretary Creedon, what led Secretary of Defense Hagel to announce plans to deploy an additional 14 ground-based interceptors (GBI) at Fort Greely, AK?

Ms. CREEDON. On March 15, 2013, Secretary Hagel announced a series of steps the United States will take to stay ahead of the challenge posed by North Korea and Iran's development of longer-range ballistic missile capabilities. The United States has missile defense systems in place to protect the homeland from limited

intercontinental ballistic missile (ICBM) attacks, but North Korea in particular has recently made advances in its capabilities. Specifically, North Korea announced last month that it conducted its third nuclear test, and last April displayed what appears to be a road-mobile ICBM. It also used its Taepo Dong-2 missile to put a satellite in orbit, thus demonstrating progress in its development of ICBM technology.

In order to bolster protection of the Homeland and stay ahead of this threat the Secretary announced four steps. First, we will strengthen Homeland missile defense by deploying 14 additional Ground-Based Interceptors (GBIs) at Fort Greely, AK. This will increase the number of deployed GBIs from 30 to 44, including the 4 GBIs at Vandenberg Air Force Base, CA.

Second, with the support of the Japanese Government, we are planning to deploy an additional radar in Japan. This second TPY–2 radar will provide improved early warning and tracking of missiles launched from North Korea at the United States or Japan.

Third, as required by statute, the Department of Defense (DOD) will consider a number of locations in the United States for a potential additional interceptor site, and DOD will complete Environmental Impact Statements (EIS) for candidate sites. Although the administration has not made any decision on whether to proceed with an additional site, completing these EISs will shorten the timeline for construction should that decision be made.

Fourth, we are restructuring the SM–3 IIB program. The timeline for deploying this interceptor had been delayed to at least 2022 due to congressional cuts in funding. Meanwhile, the threat continues to mature. By shifting resources from this lagging program to fund the additional GBIs as well as advanced kill vehicle technology that will improve the performance of the GBI and other versions of the SM–3, we will be able to add protection against missiles from Iran sooner, while also providing additional protection against the North Korean threat.

The collective result of these four decisions will be to improve further our ability to counter future missile threats from Iran and North Korea, while maximizing scarce DOD resources.

2. Senator SESSIONS. Secretary Creedon, like North Korea, Iran has demonstrated an early ICBM capability by launching satellites into space, and also seems bent on acquiring a nuclear capability. Is the administration also concerned that Iran could pose a direct threat to the United States?

Ms. CREEDON. Yes, the administration remains concerned about the potential emergence of an Iranian ICBM capable of reaching the U.S. Homeland. The United States is currently defended from a limited intercontinental-range ballistic missile capability that Iran may acquire in the foreseeable future. In March 2013, due to developments in the ICBM threat from North Korea, but also due to the continued risk of the emergence of an Iranian ICBM capability, Secretary Hagel announced several steps to strengthen existing U.S. Homeland missile defenses. In addition, the fiscal year 2014 budget request maintained funding for ongoing efforts to improve the Ground-Based Midcourse Defense (GMD) system, specifically:

- A Ground-Based Inceptor (GBI) improvement program;
- Upgrades to the Command, Control, Battle Management, and Communications (C^2BMC) systems;
- Emplacement of additional In-Flight Interceptor Communications System Data Terminal on the U.S. east coast by 2015; and
- Upgrades to the Early Warning Radars at Clear, AK, and Cape Cod, MA, by 2017.

Although Iran has not yet tested an ICBM, it has demonstrated an ability to launch small satellites, and has worked to develop larger space-launch vehicles and longer-range missiles.

The Intelligence Community (IC) assesses that Iran is developing nuclear capabilities to enhance its security, prestige, and regional influence and give it the ability to develop nuclear weapons, should a decision be made to do so. Iran has developed technical expertise in a number of areas—including uranium enrichment, nuclear reactors, and ballistic missiles—from which it could draw if it decided to build missile-deliverable nuclear weapons. The IC assesses that Iran would likely choose a ballistic missile as its preferred method of delivering a nuclear weapon, if one is ever fielded.

3. Senator SESSIONS. Secretary Creedon, with the termination of the SM–3 block IIB program, protection for the United States against Middle East threats will not be as effective as originally envisioned by two Presidents. Does this not argue for an additional missile defense site in the United States?

Ms. CREEDON. The United States is currently defended from a limited intercontinental-range ballistic missile capability that Iran may acquire in the foreseeable future. Iran has not yet tested an ICBM but has demonstrated an ability to launch a small satellite, and has worked to develop larger space-launch vehicles and longer-range missiles.

In order to bolster our protection of the Homeland and stay ahead of this potential threat, DOD is taking several steps, including deploying 14 additional GBIs at Fort Greely, AK. This will increase the number of deployed GBIs from 30 to 44, including the 4 GBIs at Vandenberg Air Force Base, CA.

Other steps are also underway. We plan to deploy an additional In-Flight Interceptor Communications System data terminal on the U.S. east coast and upgrade the Early Warning Radars at Clear, AK, and Cape Cod, MA, by 2017. Additionally, we will accelerate the command and control system's development and discrimination software to handle larger numbers of incoming ballistic missiles. These improvements in sensor coverage, command and control, and interceptor reliability will have an impact on the expected performance of the GMD system. Furthermore, we are restructuring the SM–3 IIB program to develop common kill vehicle technology to address evolving threats. I am confident that these steps will allow us to maintain an advantageous position relative to the Iranian and North Korean ICBM threats.

The Department is in the early stages of identifying at least three candidate locations for a potential third GBI site as directed by the National Defense Authorization Act (NDAA) for Fiscal Year 2013. At least two of the possible sites must be on the east coast. We will complete the EI process for the possible sites.

4. Senator SESSIONS. Secretary Creedon, the additional 14 GBIs in Alaska are meant to address the North Korean threat. What if Iran and North Korea collude? Will we then have enough missiles?

Ms. CREEDON. I cannot speculate about any North Korea and Iran collusion to attack the United States with ICBMs simultaneously. The United States currently enjoys an advantageous position of 30 deployed GBIs to counter the North Korean ICBM threat, and we are increasing that number to 44 deployed interceptors by 2017. Iran does not currently possess any ICBMs but the United States is currently defended from a potential ICBM capability that Iran may acquire in the foreseeable future. We are committed to maintaining an advantageous position vis-á-vis the threats from North Korea and Iran. DOD is undertaking continued improvement to the GMD system, including efforts to enhance GBI performance, the deployment of new sensors, and upgrades to existing sensors. We have also developed and maintained a hedge strategy within our GMD program to address possible delays in the development of new missile defense systems and the possibility that the projected ICBM threat could advance faster or could include larger numbers of ICBMs than anticipated.

5. Senator SESSIONS. Admiral Syring, how would you assess the technical and operational advantages of an additional Homeland missile defense site?

Admiral SYRING. A potential East Coast Missile Field (ECMF) would add battlespace and interceptor capacity; however, it would come at significant materiel development and service sustainment costs. We recommend that the Department complete the Continental United States Interceptor Site Study and EIS mandated by section 227 of the NDAA for Fiscal Year 2013 (Public Law 112–239) and conduct a successful Ground-Based Interceptor Capability Enhancement (CE)-II flight intercept test to validate the capability of the CE–II Exo-Atmospheric Kill Vehicle before making any decision with respect to an ECMF.

The operational advantages of an additional homeland missile defense site should be assessed by the Commander, U.S. Northern Command (NORTHCOM).

6. Senator SESSIONS. Admiral Syring, how much would such a system cost?

Admiral SYRING. Total estimated cost of $3,107 million (M) (Continental United States (CONUS)) Interceptor Site and GBIs CONUS Interceptor Site (CIS): $2,026M (Base Year 2012 dollars):

- $69 million - Military Construction (MILCON) Planning and Design
- $997 million - Major MILCON
- $960 million - Research, Development, Test, and Evaluation

GBI: $1,081 million (20 additional GBIs).

Note: Location will affect CIS cost (e.g. geology, logistics, et cetera).

7. Senator SESSIONS. Admiral Syring, how much money could you use in fiscal year 2014 to get started?

Admiral SYRING. The NDAA for Fiscal Year 2013 contained a requirement for DOD to evaluate at least three additional locations in the United States that would be best suited for hosting a missile defense base to protect the Homeland and to conduct an EIS for the candidate sites.

Currently, the EIS is not funded in the MDA PB14 request. However, MDA intends to fund the fiscal year 2014 EIS requirements ($3.641 million) within existing resources.

Once started, the EIS will require 12 to 18 months to complete. No site specific funding can be executed until completion of the EIS and subsequent identification of the selected site. The earliest that would occur is fiscal year 2015. Therefore, no additional funding is required in fiscal year 2014.

8. Senator SESSIONS. Admiral Syring, how long would it take to build an additional Homeland missile defense site?

Admiral SYRING. Five years assuming a known site—2 years for Planning and Design, and 3 years for construction. Note: Location (e.g. construction seasons, geology, et cetera) and budget programming (i.e. MILSON) will affect schedule.

9. Senator SESSIONS. Admiral Syring, would you deploy the current GBI at that site, or a two-stage version of the GBI?

Admiral SYRING. If and when a decision to deploy an East Coast Missile Defense Site is made, the specific site location and the mix of three-stage and two-stage GBIs will be established based upon the threat and performance requirements. Analysis will be performed in conjunction with NORTHCOM to determine location and optimal mix.

10. Senator SESSIONS. Admiral Syring, would such a site benefit from the deployment of an additional sensor, such as an X-band radar?

Admiral SYRING. Yes. Overall, investment in Ballistic Missile Defense System (BMDS) discrimination and sensor capabilities would result in cost-effective near-term improvements to homeland missile defense. Specifically, an additional X-band sensor would improve the effectiveness of the existing GBI sites at Fort Greeley, AK, and Vandenberg Air Force Base, CA, or at an additional East Coast Missile Defense Site. DOD is evaluating potential sensors enhancements that could be pursued to improve the BMDS kill chain and increase threat discrimination. This evaluation, and others, will serve to inform decisions on our future BMDS architecture and budget requests.

COMMON KILL VEHICLE

11. Senator SESSIONS. Admiral Syring, what is your timeline for providing a new kill vehicle for the GBI?

Admiral SYRING. The Missile Defense Agency (MDA) is developing acquisition approaches and cost estimates for maturing technology to transition to present Agency Programs of Record (GBI and SM–3) kill vehicle development. The objective is to improve the GBI's kill vehicle in three phases. Notionally, Phase I improvements will incorporate mature technology hardware and software that will improve reliability. Phase II kill vehicle improvements will enhance performance against current and some emerging threats through matured discrimination and communication technology. Phase III will evolve and develop a capability to install multiple kill vehicles on a booster stack. A specific timeline for the above phases will be provided after MDA and the Department has completed a thorough analysis.

12. Senator SESSIONS. Admiral Syring, will this timeline pace the growing threat?

Admiral SYRING. Threat assessments are continually being updated by the Intelligence Community, and using these assessments, the MDA will develop and deliver Common Kill Vehicle technology and components to expand Ballistic Missile Defense capability to address projected threats. The common kill vehicle technology effort will seek to gain higher performance and increased reliability components that can be inserted into the existing Ground Based Interceptor fleet and for potential incorporation in a future Standard Missile-3 variant.

13. Senator SESSIONS. Admiral Syring, how much will such a development effort cost?

Admiral SYRING. We are defining a phased Common Kill Vehicle technology effort to develop and transition capability to our GBI and SM–3 family of interceptors. Design solutions for the three phases are not yet complete, so precise costs are still uncertain. The MDA is working with the interceptor contractor base to finalize the content of these phases which will inform our cost estimate.

14. Senator SESSIONS. Admiral Syring, is there funding in the fiscal year 2014 request for this new kill vehicle?

Admiral SYRING. The MDA's fiscal year 2014 budget includes funding for the Common Kill Vehicle Technology effort. MDA will request funding through the Future Years Defense Plan, fiscal year 2015 and beyond to support kill vehicle improvements.

15. Senator SESSIONS. Admiral Syring, will you examine the feasibility of placing more than one kill vehicle atop the GBI?

Admiral SYRING. Yes, we will as part of our phased approach to improving the kill vehicle. Being able to destroy more than one potentially lethal object from a single interceptor will save a substantial portion of our inventory. Being able to destroy more than one lethal object also has the potential to shift the missile battle in favor of the defense.

PRECISION TRACKING SPACE SYSTEM

16. Senator SESSIONS. Secretary Creedon and Admiral Syring, why did DOD terminate the Precision Tracking Space System (PTSS)?

Ms. CREEDON and Admiral SYRING. DOD concluded that the risk and cost associated with the PTSS was too high. The program therefore was terminated.

Upon review by the Government Accountability Office, several concerns were noted. Two of the concerns critical to the decision to cancel the program were:

- The long-term program affordability due to the satellite constellation replenishment and launch vehicle costs; and
- The contract concurrency between the lab development program and the industry production program.

DOD continues to review alternatives that will provide persistent wide-area coverage at a sustainable cost.

17. Senator SESSIONS. Secretary Creedon and Admiral Syring, how do you intend to meet future sensor requirements that PTSS was intended to provide, such as tracking missile threats and warheads from birth to death?

Ms. CREEDON and Admiral SYRING. DOD and MDA understand the potential value of a persistent space-based sensor to the BMDS mission and we are studying how best to support future sensor requirements following the cancellation of the PTSS. The MDA will leverage the remaining PTSS funding to examine the layered nature of BMDS sensors to meet future sensor needs.

MDA continues to study program options and sensor solutions for the future BMDS, including space based systems. Preliminary findings from these studies show that enhancing and integrating sensors would increase the value of the scarce interceptor inventory.

An analysis of how a combination of future surface, space, and air sensors can best be combined to provide robust and affordable sensor coverage is in progress. MDA will share the results of the analysis with Congress once it is completed.

18. Senator SESSIONS. Secretary Creedon and Admiral Syring, will the missile defense system continue to have a space-based sensor layer?

Ms. CREEDON. The BMDS, through the C^2BMC element continues to take advantage of boost-phase cueing as provided by the extended family of missile warning sensors: the Air Force's Defense Support Program and Space Based Infrared System, and other Overhead Persistent Infrared (OPIR) sensors. The BMDS also uses C^2BMC to provide reverse cues to capture data from those systems for BMDS hit and kill assessments.

Those systems, however, do not have the capability to provide fire control quality missile tracks or discrimination data, as they are too distant from the threat objects. Additional space-based sensors that are closer to the threat object are necessary to deliver the warfighter requirements for tracking of a threat missile through all phases of its flight.

The MDA plans to partner with the Office of the Secretary of Defense (OSD); Air Force Space Command, Space and Missile Systems Center; U.S. Strategic Com-

mand; the National Geospatial Agency; the National Reconnaissance Office; and others on a post-PTSS space architecture study. The study will remove the traditional boundaries of space acquisitions by assessing all possible methods of providing capability: satellites or payloads hosted by MDA and non-MDA organizations, commercial or civil partnerships, fee-for-service options, capabilities of current systems or new satellite acquisitions. It will assess the logical combinations of missile defense and non-missile defense requirements for an overall acquisition that is minimally affected by the joint needs of a multi-mission customer base. It will also investigate how the complete requirements set could be divided among and assigned to multiple platforms (new or existing) if heterogeneous implementation is fiscally advantageous. Participation in the joint study will not bind the parties to participate in a joint acquisition program; yet it will identify the "art of the possible" as it pertains to delivering multi-mission capability at different budgets and schedules.

Admiral SYRING. Yes. The BMDS, through the C²BMC element continues to take advantage of boost-phase cueing as provided by the extended family of missile warning sensors: Air Force's Defense Support Program and Space Based Infrared System, and other OPIR sensors. The BMDS also uses C²BMC to provide reverse cues to capture data from those systems for BMDS hit and kill assessments.

However, those systems do not have the capability to provide fire control quality missile tracks or discrimination data as they are too distant from the threat objects. Additional space-based sensors that are closer to the threat object are necessary to deliver the warfighter requirements for birth-to-death tracking. As suggested by a draft version of the NDAA for Fiscal Year 2014 an analysis of alternatives is necessary to determine the most appropriate materiel solution for that requirement.

The MDA plans to partner with the OSD, Air Force Space Command, Space and Missile Systems Center, Strategic Command, National Geospatial Agency, the National Reconnaissance Office, and others on a post-PTSS space architecture study. The study will remove the traditional boundaries of space acquisitions by assessing all possible methods of providing capability: Satellites or payloads hosted by MDA and non-MDA organizations, commercial or civil partnerships, fee-for-service options, capabilities of current systems or new satellite acquisitions. It will assess the logical combinations of missile defense and non-missile defense requirements for an overall acquisition that is minimally impacted by the joint needs of a multi-mission customer base. It will also investigate how the complete requirements set could be divided between and assigned to multiple platforms (new or existing) if heterogeneous implementation is fiscally advantageous. Participation in the joint study will not bind the parties to participate in a joint acquisition program, yet it will identify the "art of the possible" as it pertains to delivering multi-mission capability at different budgets and schedules.

FUTURE SM–3 MISSILE

19. Senator SESSIONS. Admiral Syring, with the termination of the SM–3 block IIB program, what are the plans of DOD for a future SM–3 missile after deployment of the IIA variant in 2018?

Admiral SYRING. Long-term planning to address ballistic missile threats, including upgrades to the Aegis Ballistic Missile Defense weapons system and the need for advanced Standard Missile variants, is an ongoing process managed by the MDA in response to requirements directed by the Joint Staff, Office of Secretary of the Defense Policy, combatant commanders, and the Services. With termination of the IIB program, MDA does not currently have programmed development of a future Standard Missile-3 (SM–3) variant following delivery of the IIA.

As part of Secretary of Defense Hagel's announcement regarding missile defense priorities, there was a portion which addressed a shift of emphasis to advance kill vehicle technology and components for interceptors, which could potentially be included in SM–3 variants. MDA has initiated a Common Kill Vehicle Technology effort to improve performance and capability of Ground Based Interceptors and SM–3 variants.

20. Senator SESSIONS. Admiral Syring, is it possible for the Standard Missile to play a Homeland defense role, as originally intended for the IIB variant?

Admiral SYRING. The MDA is prepared to respond to this question, but access to the information is protected by higher program security classification restrictions. MDA is currently working with the responsible department to enable access to this information.

MISSILE DEFENSE OPERATIONS IN RESPONSE TO NORTH KOREA

21. Senator SESSIONS. Secretary Creedon and General Formica, please summarize our missile defense deployments—and those of our allies—in response to the recent threat posed by North Korea.

Ms. CREEDON and General FORMICA. During the recent North Korean provocation, the U.S. ballistic missile defense (BMD) capabilities protected the United States, our forces, and several of our allies from a possible ballistic missile attack from North Korea. Some forces were already in place to provide homeland and regional BMD capabilities, including Aegis BMD-capable ships, the AN/TPY–2 radar based in Japan, the GMD system, and other supporting sensors. In addition, we deployed a Terminal High-Altitude Area Defense (THAAD) battery to Guam and the Sea Based X-Band (SBX) radar. Allies with BMD capabilities in the U.S. Pacific Command area of responsibility also participated in this operation, providing their resources to help counter the threat.

22. Senator SESSIONS. Secretary Creedon and General Formica, what missile defense assets did we activate in the region and in the United States to address the threat?

Ms. CREEDON and General FORMICA. In addition to the GMD system for homeland missile defense, the United States activated supporting sensors, the AN/TPY–2 radar based in Japan, Aegis BMD-capable ships in the region, a deployed THAAD battery in Guam, and the SBX radar. Allies with BMD capabilities in the U.S. Pacific Command area of responsibility also participated in this operation, providing their resources to help counter the threat.

23. Senator SESSIONS. Secretary Creedon and General Formica, what lessons did you learn?

Ms. CREEDON. From a Policy perspective, the missile defense steps implemented in response to North Korea's provocations further demonstrated the strategic and diplomatic value of missile defense capabilities. By activating and deploying missile defenses, U.S. and allied leaders were able to signal resolve, enhance deterrence of ballistic missile proliferation or use, and provide a way to mitigate the threat in case of deterrence failure. Diplomatically, missile defenses were critical in assuring U.S. allies and partners that we remained willing and able to uphold our security commitments in the region. The recent episode has also highlighted the continued importance of the United States as a leader and force for stability in the region. Finally, the increased stress on low-density/high-demand missile defense capabilities further demonstrated the value of mobile and relocatable missile defense assets, which allow the United States to adapt in response to evolving threats worldwide.

General FORMICA. We learned four operational lessons in response to the recent North Korean event. The situation reinforced the need for: the capacity to simultaneously support more than one operation; sufficient indications and warnings; persistent, in depth, sensor coverage; and better integration of allies and coalition capabilities.

24. Senator SESSIONS. Secretary Creedon and General Formica, are you confident that had North Korea launched a missile capable of reaching the United States, we could have destroyed that missile in flight?

Ms. CREEDON and General FORMICA. Yes, we are confident that the GMD system, supported by other deployed/available BMD capabilities, would have been able to protect the United States from a limited North Korean long-range ballistic missile attack.

25. Senator SESSIONS. Secretary Creedon and General Formica, did we have enough Aegis-capable ships to deal with both the North Korea contingency and other potential ballistic missile threats—in the Middle East, for example?

Ms. CREEDON. Yes, DOD is able to support worldwide deployment needs. It should be noted, however, that U.S. missile defenses are in high demand across the globe. U.S. missile defense policy emphasizes the use of mobile and flexible assets in order to adapt as the threat evolves. In periods of crisis, we have the capacity to surge additional forces, but sustaining these forces at higher readiness postures may have implications on the Military Departments' ability to conduct regular training and maintenance schedules. DOD employs the global force management process to allocate these assets, balancing combatant command operational risks from a global perspective with Military Department force management risk to ensure the future health of the force. We also continue to work with allies to enhance their missile defense capabilities.

General FORMICA. Yes, DOD was able to meet its worldwide deployment needs. However, it should be noted that U.S. missile defenses are in high demand across the globe. U.S. missile defense policy emphasizes the use of mobile and flexible assets in order to adapt as the threat evolves. In periods of crisis, we have the capacity to surge additional forces, but sustaining these forces at higher readiness postures may have implications on the Services' ability to train and maintain. The Department employs the global force management process to allocate these assets, balancing combatant command operational risks from a global perspective with Service force management risk to ensure the future health of the force. Aegis BMD-capable ships and SM–3 interceptors are high demand assets that must be carefully managed during the global force management process in order to meet demand. We can only surge for a defined period and still meet multi-mission requirements.

QUESTIONS SUBMITTED BY SENATOR DAVID VITTER

ARMY/NAVY TRANSPORTABLE RADAR SURVEILLANCE—MODEL 2

26. Senator VITTER. Admiral Syring, with the number of increasing threats around the world, such as threats to Israel and Turkey posed by Syrian instability; to U.S. Central Command (CENTCOM) posed by Iran; and to U.S. Pacific Command (PACOM) by increasingly frequent missile tests by North Korea, there is an urgent demand by combatant commands (COCOM) for missile defense capabilities. While Congress provided funding in fiscal year 2013 for the procurement of a 12th TPY–2 to keep pace with COCOMs' demands, the fiscal year 2014 defense budget request does not contain adequate funding to procure a 13th TPY–2. How does the MDA intend to continue TPY–2 production when the funding request is $115 million short of what is necessary?

Admiral SYRING. The President's budget request for 2014 reflects the current warfighter radar unit requirements. The $62 million procurement funding requested in President's budget 2014 is to purchase a float Cooling Equipment Unit, radar critical spares and long lead Transmit/Receive Integrated Microwave Modules for the float Antenna Equipment Unit. The President's budget does not request funds for a 13th AN/TPY–2 radar.

The MDA will readdress COCOM sensor requirements as a part of the President's budget request for fiscal year 2015.

MDA supports the Joint Staff, the Services, and the combatant commanders through participation in the warfighter involvement process. This process allows the warfighter to establish priorities for equipment and capabilities, and MDA satisfies those priorities within budget and schedule constraints. The final program plan is adjudicated by the Missile Defense Executive Board where all stakeholders are represented. This process ensures that maximum capability is provided within resources available.

PATRIOT MODERNIZATION

27. Senator VITTER. General Formica, COCOMs' demands for the Patriot system have continued to increase given the nature of threats to our forward deployed forces. However, the President's fiscal year 2014 budget request does not address the $50 million cut to the Radar Digital Processor (RDP), which is necessary to make upgrades to make Patriot processors compatible with commercial-off-the-shelf (COTS) processors, causing upgrades to RDP to be delayed. What is the Army's timeline for undertaking modernization efforts to the Patriot system, such as the RDP, in order to meet demand?

General FORMICA. As a result of the fiscal year 2013 $50 million RDP cut and a new contractor cost estimate, the Army believes the cost to recover has grown to $94 million. Additionally, the Army will need to recover from the RDTE mark of $60 million, which affects software development required to defeat current threats while leveraging RDP and Missile Segment Enhancement (MSE) Missile capability. As a result of the fiscal year 2013 RDP cut, the Army anticipates a minimum 2-year slip in the delivery of 25 RDPs to the COCOMs. Whereas these RDPs would have been fielded in fiscal year 2015–fiscal year 2016, they will now be fielded no earlier than fiscal year 2017–fiscal year 2018, delaying availability of enhanced radar processing to the COCOMs. Similarly, as a result of the $60 million fiscal year 2013 RDT&E cut, associated software capabilities designed to leverage the RDP and the MSE missile will slip 1 to 3 years to the right.

JOINT LAND ATTACK CRUISE MISSILE DEFENSE ELEVATED NETTED SENSOR SYSTEM

28. Senator VITTER. General Formica, the Army has announced plans to demonstrate one of two existing Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS) systems from Aberdeen Proving Ground starting in late 2013 or early 2014, in support of the North American Aerospace Command (NORAD) mission to defend the National Capital Region, monitoring land, air, and sea traffic from Norfolk to New York. DOD is expected to make a decision regarding procurement of this capability for COCOM deployment in fulfillment of validated requirements from NORTHCOM, U.S. Southern Command (SOUTHCOM), PACOM, and CENTCOM. Is the Army currently reviewing the feasibility of an outside the continental United States (OCONUS) JLENS demonstration in support of COCOMs' demands?

General FORMICA. The Army does not have a requirement to deploy the second orbit and is not conducting planning for deploying the second JLENS orbit to an Outside the Continental United States location at this time. The OSD, in an Acquisition Decision Memorandum (ADM) signed on May 24, 2012, directed the Army to complete the JLENS Test and Evaluation Program through Developmental Test number 3 ending in fourth quarter of fiscal year 2013; assist in site selection and planning for an employment of one JLENS orbit in the Continental United States; to conduct the exercise; to continue to develop planned capabilities, assess test results and correct short-comings/deficiencies; and to develop documentation to track and assess program status. The ADM directs the Army to not procure the support equipment and government-furnished equipment required for the second orbit or plan for entry of the JLENS program into the production phase. The Joint Requirements Oversight Committee (JROC) concurred to deploy JLENS to Aberdeen Proving Ground, MD, for an operational exercise from fiscal year 2014 to fiscal year 2017, using one of two Engineering and Manufacturing Development orbits. The President's fiscal year 2014 budget requests funding to support limited operations of the Program Office, fund military construction for APG in support of the exercise, and provide funds to support the exercise.

QUESTIONS SUBMITTED BY SENATOR MIKE LEE

MISSILE DEFENSE NEGOTIATIONS WITH RUSSIA

29. Senator LEE. Secretary Creedon and Admiral Syring, do you believe it is in the national security interests of the United States to declassify information or alter our strategic defense posture because of the objections of another country?

Ms. CREEDON. No. Russia will not be allowed to have a veto on U.S. missile defense plans, programs, and decisions. The President has made clear on numerous occasions that cooperation with Russia will not in any way limit U.S. or North Atlantic Treaty Organization (NATO) missile defenses. The United States is committed to develop and deploy missile defenses that are affordable and effective against projected threats. The United States will not provide any information to Russia that would compromise U.S. national security.

Admiral SYRING. Missile defense discussions with the Russian Federation have been led by the Chairman of the Joint Chiefs of Staff, Under Secretary of Defense for Policy, and Under Secretary of State for Arms Control and International Security. I defer specific questions on U.S.-Russia Federation missile defense discussions as well as questions related to national security policy to them.

30. Senator LEE. Secretary Creedon, what proposals were discussed between Under Secretary James Miller and Russian Deputy Defense Minister Anatoly Antonov?

Ms. CREEDON. Under Secretary Miller and Minister Antonov discussed the missile defense-related aspects of the letter that President Obama sent to President Putin in February 2013. Specifically, Dr. Miller described the proposal for missile defense cooperation and transparency that was included in President Obama's letter. The Russian officials appreciated the opportunity for detailed discussions and said that Russia's response is pending further consideration.

The U.S. objective in these talks is to explore opportunities for mutually beneficial missile defense cooperation and to reassure Russia that our missile defenses are not a threat to Russia's security and will not undermine strategic stability. The United States will not accept limitations on its missile defenses.

Prior administrations, both Democratic and Republican, have sought such cooperation and transparency because they also deemed this to be in the U.S. interest.

We are prepared to brief Congress on this issue.

31. Senator LEE. Secretary Creedon, are there any plans for regular talks to take place with the Russian Government on missile defense? If so, please elaborate on what these meetings would entail.

Ms. CREEDON. The United States plans to continue its dialogue with Russia on opportunities for missile defense cooperation. This dialogue has continued under both Republican and Democratic administrations, going back many years. We are pursuing a bilateral U.S.-Russia dialogue, and U.S. officials regularly provide readout briefings to our NATO allies on the substance of such discussions, and will continue to inform our allies as discussions progress. At the same time, we are also continuing to explore opportunities for missile defense cooperation in a multilateral setting via the NATO-Russia Council. The U.S. objective in these talks is to pursue mutually beneficial missile defense cooperation and to reassure Russia that our missile defenses are not a threat to Russia's security and will not undermine strategic stability. In both tracks, we will not accept limitations on U.S. missile defenses.

32. Senator LEE. Secretary Creedon, General Formica, and Admiral Syring, if DOD decided that additional missile defense systems needed to be deployed for the protection of the United States, domestically or around the world, would the Russian Government be consulted before the decision was made?

Ms. CREEDON. The United States will continue to discuss missile defense with Russia and explore opportunities for cooperation, but Russia will not be allowed to have a veto on U.S. missile defense plans, programs, and decisions. The President has made clear on numerous occasions that cooperation with Russia will not in any way limit U.S. or NATO missile defenses. The United States is committed to develop and deploy missile defenses that are affordable and effective against projected threats.

General FORMICA. If DOD were to decide that additional missile defense assets should be deployed to protect the United States, Joint Functional Component Command for Integrated Missile Defense would provide operational assessments of the projected deployments based on threat and capability. Decisions as to which foreign partners or other entities should be consulted are made at other levels in the Department. As the warfighter, we will execute deployment decisions tasked to us by the National Command Authority.

Admiral SYRING. Missile defense discussions with the Russian Federation have been led by the Chairman of the Joint Chiefs of Staff, Under Secretary of Defense for Policy, and Under Secretary of State for Arms Control and International Security, and I defer specific questions on U.S.-Russia Federation missile defense discussions to them.

QUESTIONS SUBMITTED BY SENATOR KELLY AYOTTE

FORCE PROTECTION ASSETS

33. Senator AYOTTE. Admiral Syring, AN/TPY–2 was designed to provide both THAAD fire control and precision track information to the BMDS. Congress in both the NDAA for Fiscal Year 2013 and the fiscal year 2013 Continuing Resolution provided funds ($163.0 million) for procurement of a 12th radar to meet this demand. The fiscal year 2014 budget request does not contain funding to procure a 13th radar to keep pace with increasing threats (it only contains $62.0 million). An additional $115.0 million would be required to do so. Stabilized TPY–2 production also enables MDA to preserve the option of using existing technologies—like TPY–2 and the SM–3—to provide an east coast missile defense solution. There are a number of increasing missile threats around the world. In the NDAA for Fiscal Year 2013, funding for an additional TPY–2 radar was included to meet growing COCOM demands for missile defense. I understand the demand has increased from the COCOMs for additional missile defense capabilities like the TPY–2 radar. How does MDA intend to continue TPY–2 production?

Admiral SYRING. There are validated warfighter requirements for more THAAD batteries than are funded in the President's budget. AN/TPY–2 radar procurement must be budgeted as part of additional THAAD battery procurements.

The MDA supports the Joint Staff, the Services, and the combatant commanders through participation in the Warfighter Involvement Process. This process allows the warfighter to establish priorities for equipment and capabilities, and MDA satisfies those priorities within budget and schedule constraints. The final program plan is adjudicated by the Missile Defense Executive Board where all stakeholders are represented. This process ensures that maximum capability is provided within resources available.

34. Senator AYOTTE. Admiral Syring, would additional funding to MDA, to provide an additional THAAD system with a TPY–2 radar, help meet that need by the COCOMs?

Admiral SYRING. There are validated warfighter requirements for more THAAD batteries than are funded in the President's budget. Additional funding would help meet this warfighter requirement, but at the expense of other higher priority DOD requirements.

The MDA supports the Joint Staff, the Services, and the combatant commanders through participation in the warfighter involvement process. This process allows the warfighter to establish priorities for equipment and capabilities, and MDA satisfies those priorities within budget and schedule constraints. The final program plan is adjudicated by the Missile Defense Executive Board where all stakeholders are represented. This process ensures that maximum capability is provided within resources available.

35. Senator AYOTTE. Admiral Syring, in response to increased threats in the Pacific region, DOD has relocated the test-bed TPY–2 in theater. Its unavailability will slow down refinements necessary to leverage the continuous flow of intelligence regarding evolutions in the missile threats observed. This makes permanent deployment of this asset uncertain, creating gaps in missile defense capabilities. Scarcity of assets further strains operations due to a lack of spare parts and production focus on addressing obsolescence. Would additional funding for the continuation of the THAAD system, including an additional TPY–2 radar, relieve COCOM strain on the current inventory of force protection assets?

Admiral SYRING. There are validated warfighter requirements for more THAAD batteries than are funded in the President's budget. Additional funding would help meet these warfighter requirements, but at the expense of other higher priority DOD requirements.

The MDA supports the Joint Staff, the Services, and the combatant commanders through participation in the Warfighter Involvement Process. This process allows the warfighter to establish priorities for equipment and capabilities, and MDA satisfies those priorities within budget and schedule constraints. The final program plan is adjudicated by the Missile Defense Executive Board where all stakeholders are represented. This process ensures that maximum capability is provided within resources available.

PATRIOT MODERNIZATION

36. Senator AYOTTE. General Formica, in fiscal year 2013, the Army unsuccessfully attempted to reclaim $50.0 million from a total of $199.6 million in the Patriot modernization account for upgrades to the Radar Digital Processor (RDP). RDP upgrades make Patriot processors compatible to modern commercial off-the-shelf processors, driving down cost, increasing reliability, and creating space for needed software upgrades. This upgrade was part of a validated modernization plan. The fiscal year 2014 President's budget, $256.4 million for Patriot modernization, does not address the $50.0 million cut to RDP upgrades needed for the entire U.S. Patriot fleet. These upgrades are currently in production or being delivered to allied nations like the UAE and Saudi Arabia. COCOM demand for the Patriot system continues to increase, given the nature of threats to our forward deployed forces. Much needed upgrades to Patriot planned for fiscal year 2013, like the RDP, have been delayed. The Army has not yet offered a time or cost schedule to undertake these upgrades to meet demand. I understand COCOM demand for missile defense capabilities continues to grow. How have fiscal year 2013 cuts to the Patriot system impacted the Army's ability to deliver these capabilities?

General FORMICA. The President's fiscal year 2014 budget (PB14) request does not address the fiscal year 2013 $50 million RDP cut or the $60 million Research, Development, Test, and Evaluation (RDT&E) cut because the timing of the fiscal year 2013 budget did not allow for changes to the PB14 request prior to submission. As a result of the fiscal year 2013 RDP cut and a new contractor cost estimate, we believe the cost to recover from the $50 million fiscal year 2013 RDP cut has grown to $94 million. Additionally, the Army will need to recover from the RDTE mark of $60 million, which affects software development required to defeat current threats while leveraging RDP and Missile Segment Enhancement (MSE) Missile capability. As a result of the fiscal year 2013 RDP mark, the Army anticipates a minimum 2 year slip in the delivery of 25 RDPs to the COCOMs. Whereas these RDPs would have been fielded in fiscal year 2015–2016, they will now be fielded no earlier than fiscal year 2017–2018, delaying availability of enhanced radar processing to

the COCOMs. Similarly, as a result of the $60 million fiscal year 2013 RDT&E cut, associated software capabilities designed to leverage the RDP and the MSE missile will slip 1 to 3 years. The RDP and critical software upgrades delayed by the RDT&E cut are key enablers for Patriot, required to defeat proliferated threats, improve combat identification, and best capitalize on the increased capability of the MSE.

37. Senator AYOTTE. General Formica, what is the Army's timeline for undertaking modernization efforts for upgrades such as the RDP?

General FORMICA. Patriot modernization is a critical effort that will be slowed significantly as a result of fiscal year 2013 cuts. The current Patriot modernization effort hinges on the RDP and associated RDT&E funded software upgrades. As a result of the fiscal year 2013 RDP cut, the Army anticipates a minimum 2-year slip in the delivery of 25 RDPs to the COCOMs. Whereas these RDPs would have been fielded in fiscal year 2015–fiscal year 2016, they will now be fielded no earlier than fiscal year 2017–fiscal year 2018, delaying availability of enhanced radar processing to the COCOMs. Similarly, as a result of the $60 million fiscal year 2013 cut, many of the associated software capabilities designed to leverage the RDP and the MSE missile will slip 1 to 3 years, fielding capability to the warfighter in fiscal year 2017–2019 rather than in fiscal year 2016 as previously planned.

GUIDANCE ENHANCED MISSILE-TACTICAL

38. Senator AYOTTE. General Formica, the Army has announced plans to begin recertification of the Guidance Enhanced Missile-Tactical (GEM–T) but has not articulated whether their timeline will meet the fiscal year 2015 expiration date or whether operation and maintenance (O&M) accounts have sufficient funding to undertake this effort. In equipping our COCOMs with the best missile inventory possible and in the most efficient manner, the Army is to be applauded for undertaking GEM–T recertification. Does the Army anticipate achieving this recertification by the end of fiscal year 2015 and does it have the resources necessary to do so at this time?

General FORMICA. The Army has not determined that Legacy Patriot [Patriot Advanced Capability (PAC)-2, Guidance Enhanced Missile (GEM), GEM Plus] missile recertification will be necessary to support the Total Army Munitions Requirement (TAMR). Raytheon recently concluded a service life extension study to determine the feasibility of a 15-year life extension. The Lower Tier Project Office has issued a memorandum stating the service life of Legacy Patriot missiles may be extended from 30 to 45 years for an additional cost. Currently, the Army is reviewing Raytheon's study. Once a decision has been made, the appropriate programming and budgeting actions will be executed.

JOINT LAND ATTACK CRUISE MISSILE DEFENSE ELEVATED NETTED SENSOR SYSTEM

39. Senator AYOTTE. General Formica, the Army has announced plans to demonstrate one of two existing JLENS systems from Aberdeen Proving Ground, starting in late 2013 or early 2014, in support of the NORAD mission to defend the National Capital Region, monitoring land, air, and sea traffic from Norfolk to New York. DOD is expected to make a decision regarding procurement of this capability for COCOM deployment in fulfillment of validated requirements from NORTHCOM, SOUTHCOM, PACOM, and CENTCOM. In anticipation of the JLENS demonstration at Aberdeen Proving Ground, has the Army worked with the Under Secretary of Defense for Acquisition, Technology, and Logistics, and other Services, especially the Navy, to identify performance data to be captured in support of a future procurement decision criteria?

General FORMICA. The Army is coordinating with NORAD/NORTHCOM and its subordinate Service components to provide a COCOM assessment of the JLENS capability. This assessment will inform the Department on the feasibility of an enduring mission for JLENS. The Army continues to work through the Joint Integrated Air and Missile Defense Organization on data needed to inform a future decision. The JLENS Exercise was concurred to by the JROC, in which the Navy participated. The Army has also conducted a successful test event with the Navy Desert Ship (Aegis Destroyer surrogate) to demonstrate the capability to execute a joint engagement.

40. Senator AYOTTE. General Formica, is the Army currently reviewing the feasibility of an OCONUS JLENS demonstration in support of COCOMs' demands?

General FORMICA. The Army does not have a requirement to deploy the second orbit and is not conducting planning for deploying the second JLENS orbit to a location outside the continental United States at this time.

[Whereupon, at 4 p.m., the subcommittee adjourned.]